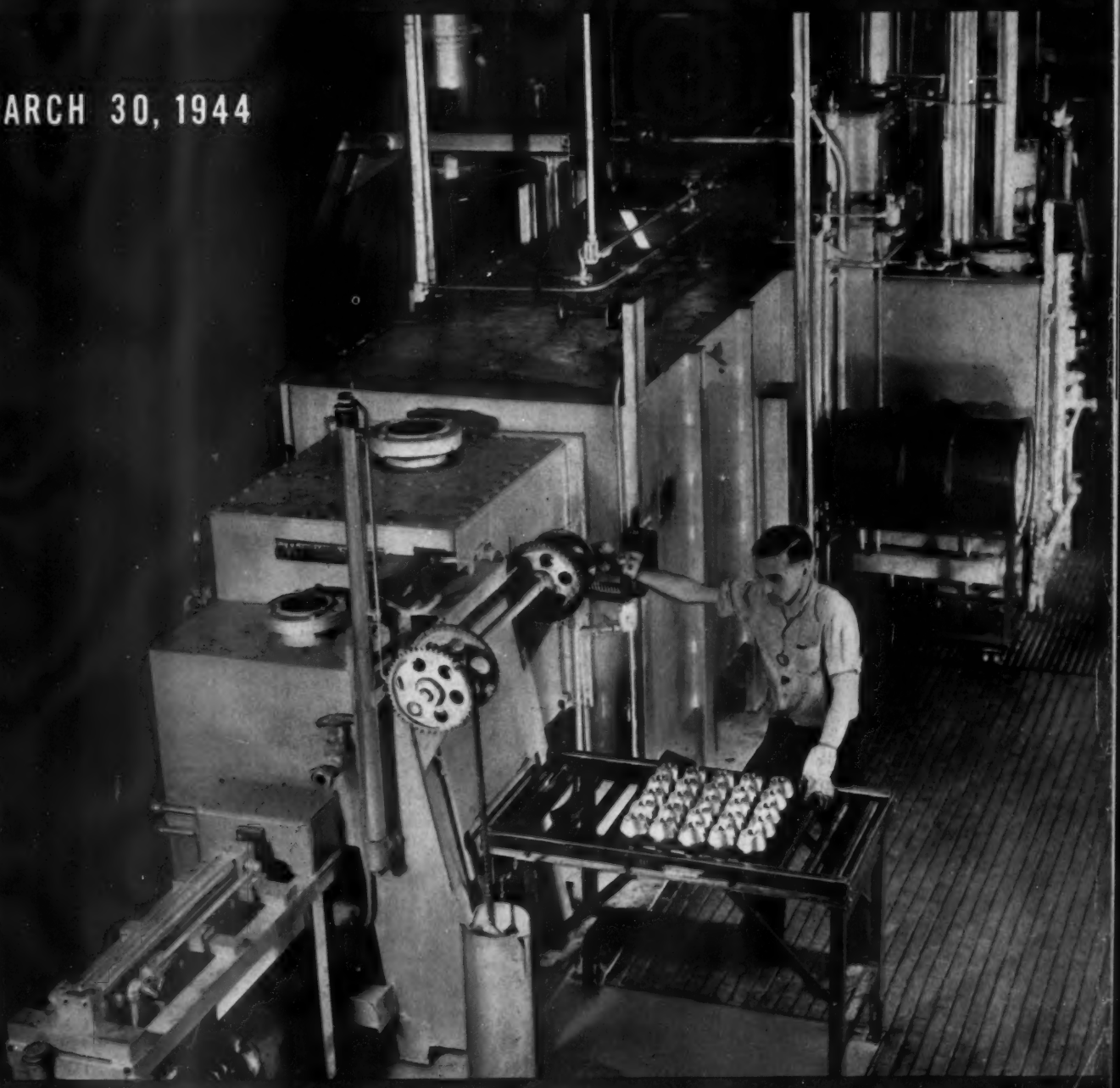
AMERICAN MACHINIST

MARCH 30, 1944



What's Ahead in Heat-Treating—Page 83

Precision Roughing

A POST-WAR OPPORTUNITY
Worth Investigating Now!

ALL DONE ON A SINGLE HEALD BORE-MATIC!

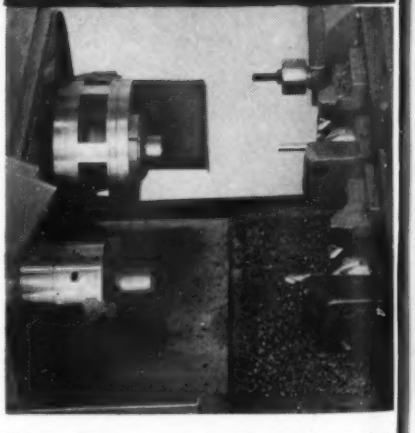
A NEW SLANT—a time and cost-saving one—for those engaged in post-war planning is this . . .

perform secondary operations, plus final finishing, on one machine . . . The Heald Bore-matic.

Because it is a precision machine with vibrationless operation inherent in its design, use of the Bore-matic for roughing as well as finishing operations on many types of work is entirely practical. Many times, one cut, from either forging or casting, will do the job successfully.

As plus values, precision roughing on Bore-matics is characterized by better finish, improved accuracy and longer tool life. Ideal surfaces, too, are produced—both with respect to alignment and stock distribution—for final finishing also done on Heald Bore-matics.

To plan your better post-war products; to lower costs; to keep a jump ahead of competition; to get dual use from each machine . . . get in touch with Precision Headquarters, where "thinking it out, pays out." The Heald Machine Co., Worcester, Mass.



This automotive gear, except for cutting teeth, is completely finished from the rough on the Heald Bore-matic. Gears are rough and finish turned, drilled and finish bored, rough and finish faced, and chamfered on both outside and inside diameters, with good accuracy and finish.

HEALD *for more Precision . . . Faster!*

Internal and Surface Grinding Machines • Bore-matic Precision Finishing Machines

American Machinist

March 30, 1944

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McGRAW-HILL PUBLISHING COMPANY, 330 West 42 Street, New York 18, N. Y.
Director of Circulation: Please change my address on American Machinist

From _____

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To _____

_____

Signed _____

AMERICAN MACHINIST —chips

Something Hot . . . The lead article in this issue, "A Look At Heat-Treating," is the opening gun of a series which we predict will make editorial history.

The overall subject of these special sections is "Metal-Working Tomorrow" . . . an attempt to picture for you what types of production equipment, materials and processes will come into general use during the next few years as a result of developments now achieved and those looming ahead. Some of these developments are revolutionary, some merely the result of gradual progress. Most all of them have been spurred by the war. *American Machinist* editors have spent months in the field studying current and proposed Metal-Working practices and talking with practical shop executives in leading plants. They have combed sources of news for every scrap of information pertinent to the subject. Finally, this mass of data has been carefully examined and a probable outline of coming Metal-Working techniques evolved.

This series will not be in any sense a glorified, visionary fantasy of the future with which Sunday supplement writers love to dazzle the public. It will be merely a collection of the newest and best ideas, a reporting of trends and a reasonable projection of those ideas and trends into the not-too-distant future.

Subsequent chapters of "Metal-Working Tomorrow" will cover other phases of shop practice and conditions. Reprints will be available at the usual 10¢ each. The editors would certainly like to get your reaction to this initial section on heat-treating, as well as any suggestions you may have for future subjects.

o

New Products . . . *While speaking of the shape of things to come, we'll toss in a little reporting of new product ideas: Two household standbys may have become obsolete during the war. Progress in distribution of frozen foods, plus wide expansion of home gardens, is making a sub-zero combination refrigerator a necessity for most apartments. Large numbers of home owners will be consumers for more deep-freeze boxes.*

A survey made by a prominent manufacturer of washing machines showed that fully one washer out of three sold following the war would be an automatic. A number of firms have automatics ready to go or in the offing.

A high-up radio executive concludes that there will be from 18,000,000 to 22,000,000 homes equipped with frequency modulation radio sets within five years after the war ends.

o

Steel Eater . . . Shipbuilding in 1943 continued to hold first rank as a wartime consumer of steel. Yards of naval and merchant vessel shipbuilders received 11,433,000 tons of finished and semi-finished steel products, or 19.1% of the total.

o

Packing a Punch . . . *International Nickel reports that alloy cast iron punch tips are being used successfully for forging shells. Advantages mentioned over the standard punch-and-die extrusion process included material, labor and tool savings and more rapid production to closer tolerances.*

o

Nothing Lost . . . Mr. Gus Haessler of Chicago Heights, Ill., pens a lament on the passing of "Ideas From Practical Men" as a result of its recent union with the department "War Winning Suggestions." Dry those tears, Mr. Haessler . . . your friends are still with you, healthier than ever.

We'd like to make it very clear to one and all that not a jot of value has been taken from these practical ideas. The new set-up is purely a matter of rearrangement.

Thanks to Mr. Haessler, by the way, for his orchid "I am indebted to the editors and contributors of *American Machinist* for many ideas which have helped maintain myself in the last 50 years."

Don't Blame Us . . . *The* Studebaker Spotlight *defines a pink elephant as a beast of bourbon.*

o

D-C Motors . . . You might be interested in some figures presented by James W. Corey of Reliance Electric in his capacity as Chairman of the Motor and Generator Section of NEMA.

Production of direct current motors rose from 27% of the total in 1937 to 52% at the end of 1943. In the same period synchronous motors and alternaters rose from 11% to 20%, whereas alternating current types dropped from 62% to 28%.

Motor manufacturers coped with the problems entailed in this severe change while expanding their production to maintain 5 times the pre-war peak.

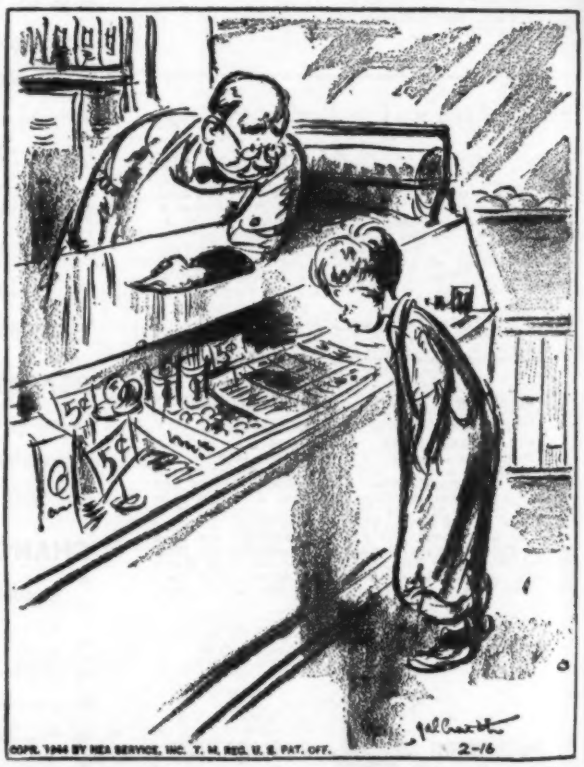
o

Birthday . . . *So engrossed were we in sticking our inquisitive nose into other people's Metal-Working business we damn near forgot to observe that* "Chips" *(in its present form) is just a year old with this issue.*

If asked to make a speech about it, which we weren't, we would invite you to cut yourself a piece of cake by remembering to consider "Chips" *at all times your forum for the expression of ideas and comments . . . brickbats included.*

Side Glances

By Galbraith



"Everything you've got is a nickel, Mr. Jones, and I've only got four cents—will you renegotiate?"

(Courtesy NEA Service and The New York World-Telegram)

BEVEL GEAR DRIVES — TO *Victory*

Gleason-cut spiral bevel gear drives . . . for earth moving equipment

CLEARING THE WAY TO VICTORY

In the face of shell-fire and dive bombing, American earth-moving machines and the intrepid men who operate them are truly setting the pace of the Allied advance toward victory. Whether on Kwajalein or at Cassino, these husky units quickly build airfields and roads so that our mechanized equipment can function.

The efficiency of these machines . . . their ability to move heavy loads over rough terrain and steep grades with the power of a tractor and the speed of a truck, is a tribute to American engineering and production skill.

DURABLE POWER TRANSMISSION PROVIDED BY SPIRAL BEVEL GEARS

Spiral bevel gears furnish the means of transmitting smoothly the driving power for these machines as it makes a right-angle turn from the motor and transmission into the wheel units. These gears have met the test — standing up under the heavy and shock loading which is characteristic of the rigorous conditions under which these machines operate.

CUT ON GLEASON MACHINES

Both pinions and gears are produced with great accuracy and in amazing quantities on the No. 26 Machines, aided by essential Gleason auxiliary equipment.

This is just one of many illustrations of the part spiral bevel gears play in providing high standards of performance for power driven machinery. This war-proven capability of spiral bevel points the way to new types of power transmission for the machines of tomorrow.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

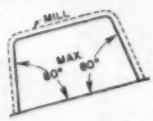
Milling UPHILL *and* DOWN!

WITH TRACER CONTROLLED HYDROMATICS

CINCINNATI

The profiles milled by these machines may be straight lines or curves, or a combination of the two. Even external box-shaped profiles can be handled in two operations. The table feed is automatically varied to obtain maximum efficiency of metal removal. Four possibilities of Tracer Controlled milling are shown here.

1



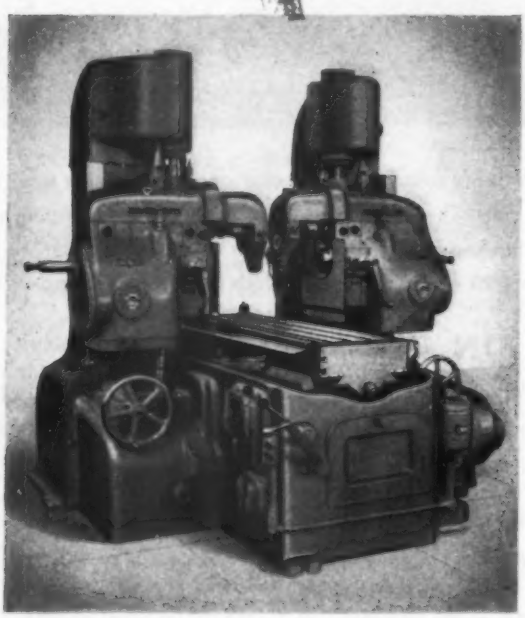
Steepness of vertical walls must not exceed 80°, and part milled on external surface only.

2

Straight lines and curves, similar to aircraft engine connecting rods, master rods, crankshaft, etc.

3

Arc of circle must not exceed 160°, starting with 10° inclination from the horizontal.

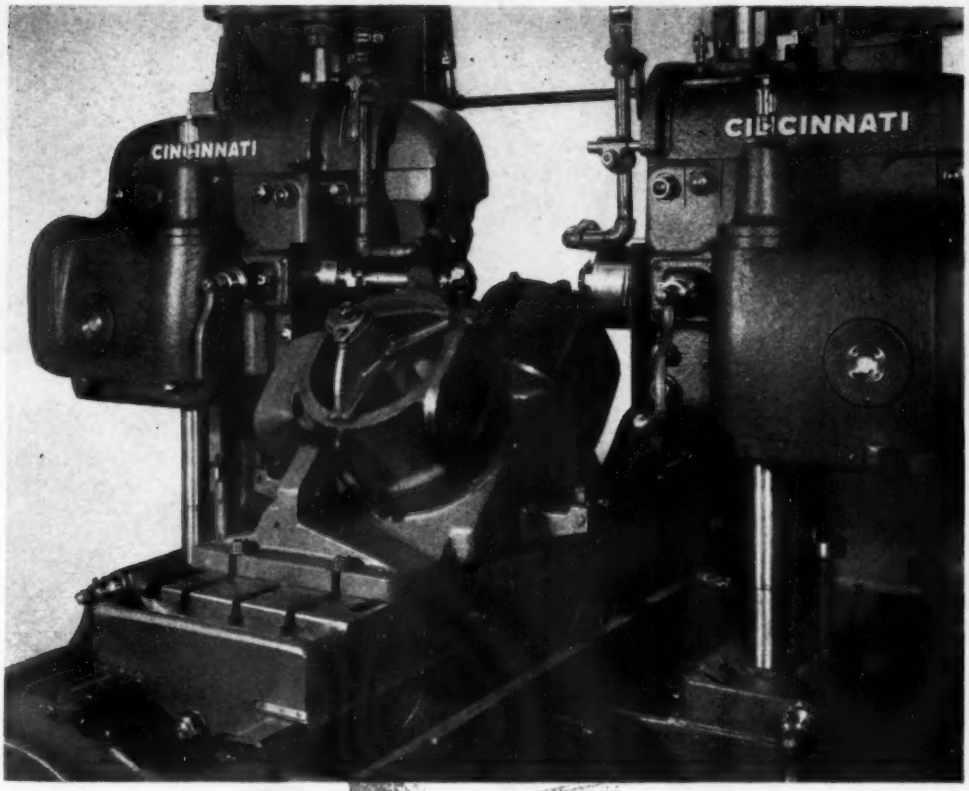


Illustrated at the left is the CINCINNATI *Tracer Controlled Hydromatic Milling Machine (Duplex model). Both the Plain and Duplex models are available in 12 sizes. Catalog M-1295 gives complete information and specifications. Sweet's Catalog File for Mechanical Industries contains a brief description of these machines.*

Keep on buying WAR BONDS

THE CINCINNATI M

MILLING MACHINES

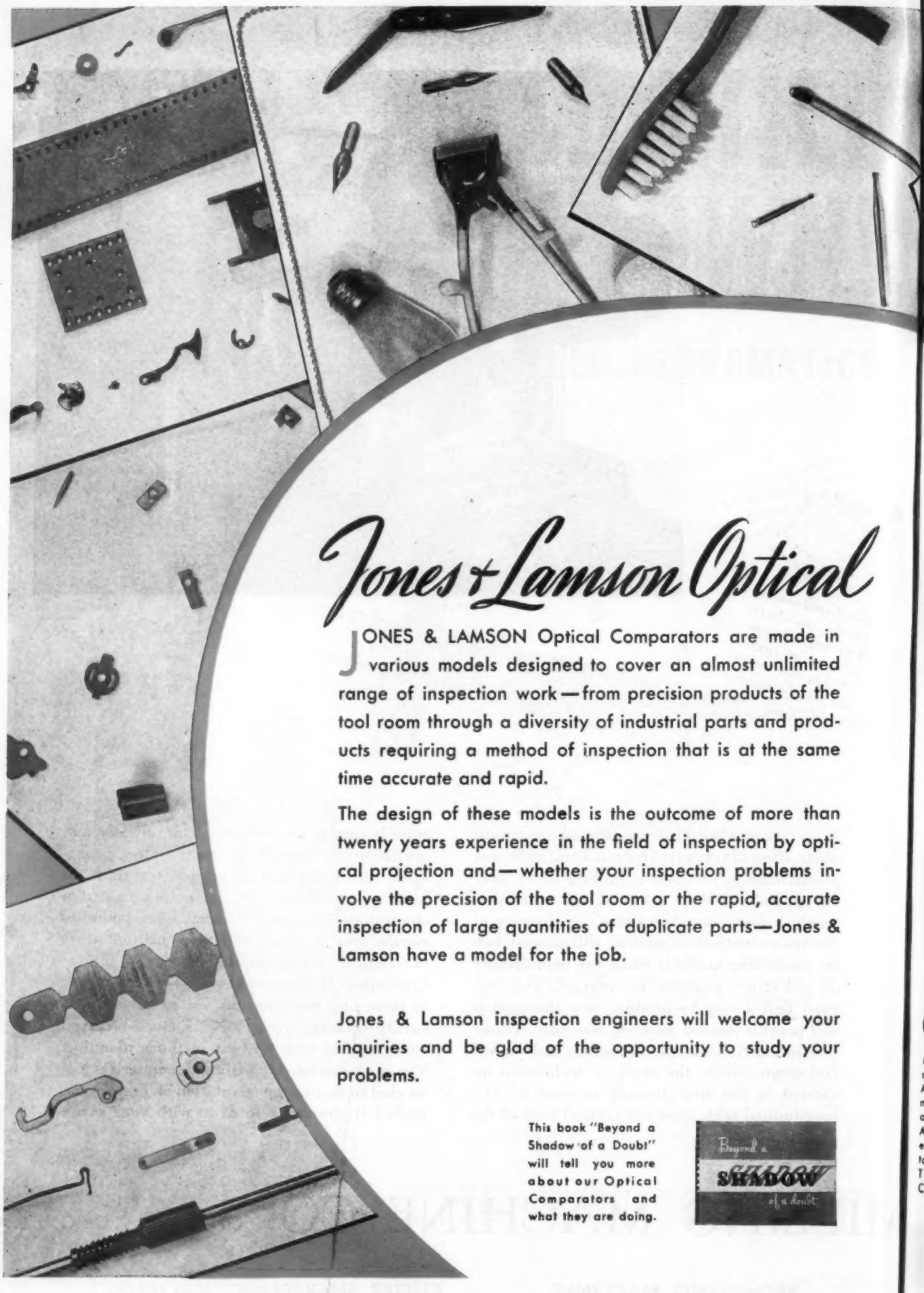


Box-shaped contour (male member). Two opposing corners can be rounded, but the other two must be square.

Tracer Controlled Hydromatics, an outgrowth of standard CINCINNATI Hydromatics, offer new possibilities in production milling which may be applied NOW in retooling for more economical operation. And today's application of the tracer method of milling will suggest better machining methods when the manufacture of peacetime products is resumed, and you must find a way to produce new things that will provide needed jobs. ¶ Basically, Tracer Controlled Hydromatics accurately mill uphill and down, within the angle of inclination indicated in the line drawing marked 1. The longitudinal table feed and vertical feed of the spindle carrier are actuated hydraulically and synchronized through a tracer valve mechanism which contacts a master template attached to the fixture. ¶ After the war, design changes and increased production are bound to require new methods and more efficient ways of handling certain milling operations. Tracer Controlled Hydromatics may be the answer to these new requirements. Their possibilities surely warrant your serious consideration NOW, and in your postwar methods planning. The engineers here at Milling Headquarters will be glad to discuss the adaptation of Tracer Controlled Hydromatics to fit in with your plans.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES



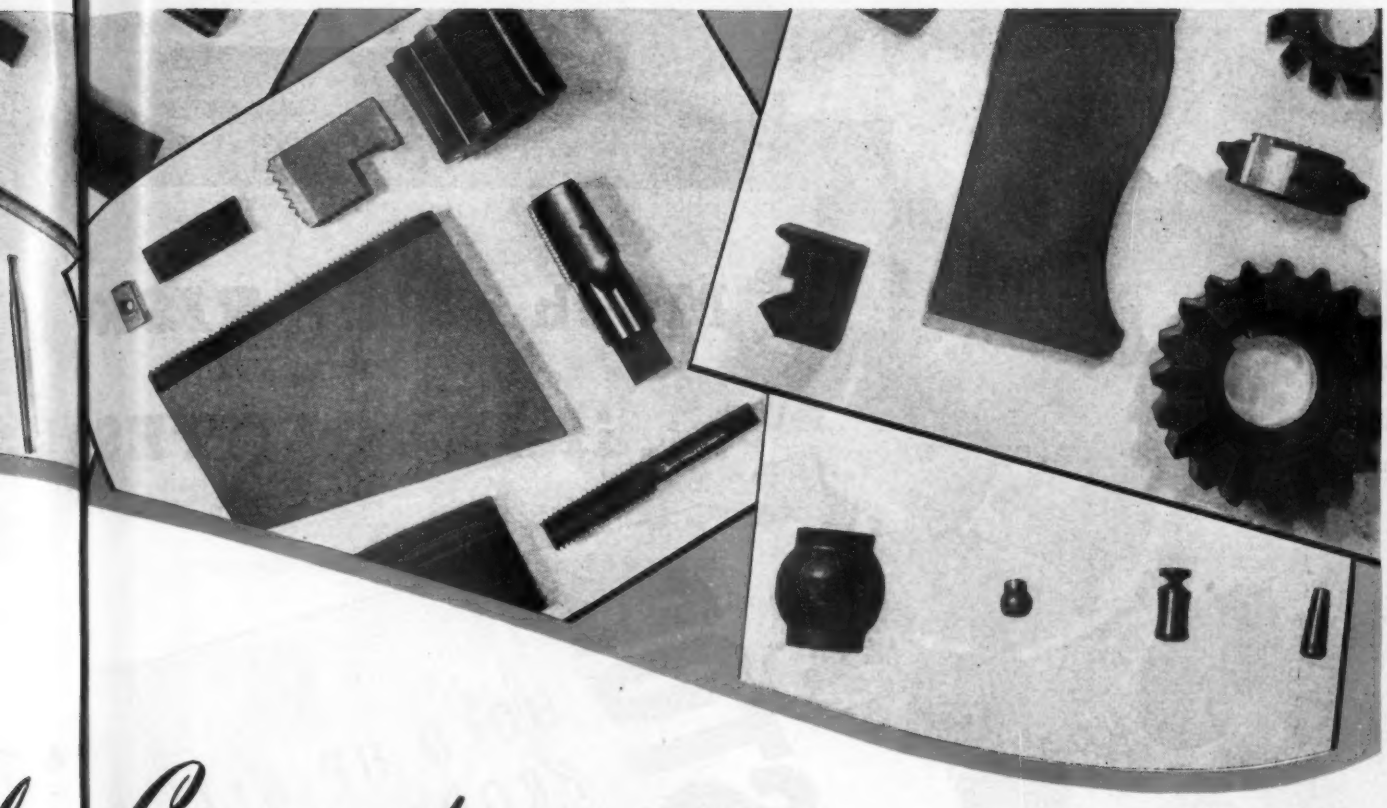
Jones & Lamson Optical

JONES & LAMSON Optical Comparators are made in various models designed to cover an almost unlimited range of inspection work—from precision products of the tool room through a diversity of industrial parts and products requiring a method of inspection that is at the same time accurate and rapid.

The design of these models is the outcome of more than twenty years experience in the field of inspection by optical projection and—whether your inspection problems involve the precision of the tool room or the rapid, accurate inspection of large quantities of duplicate parts—Jones & Lamson have a model for the job.

Jones & Lamson inspection engineers will welcome your inquiries and be glad of the opportunity to study your problems.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.



Comparators – A MODEL FOR EVERY JOB...

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.

2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*

3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.

4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.

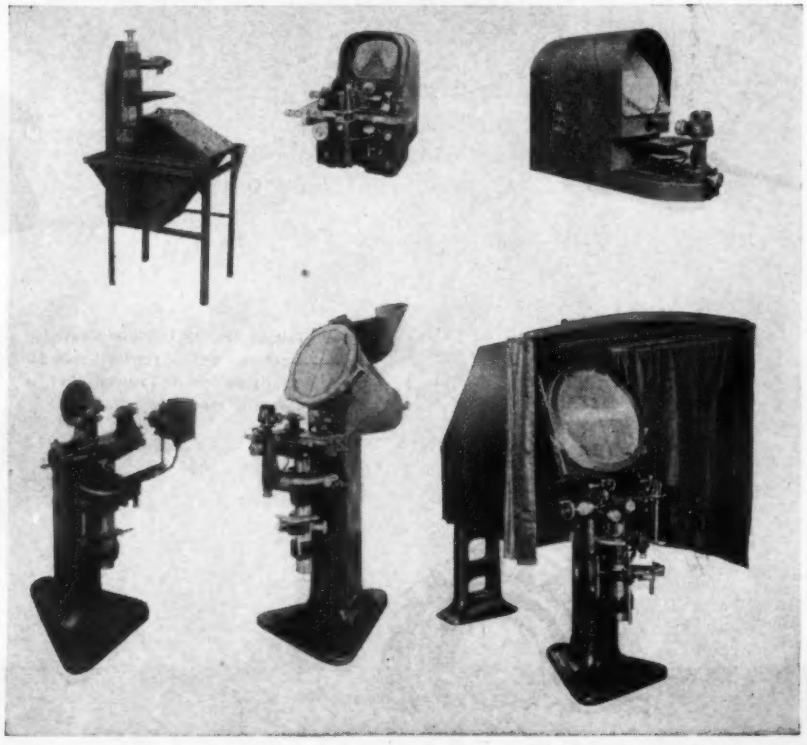
5. Rigid Machine Construction.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

PROFIT-PRODUCING MACHINE TOOLS



Much of the *RISK* is

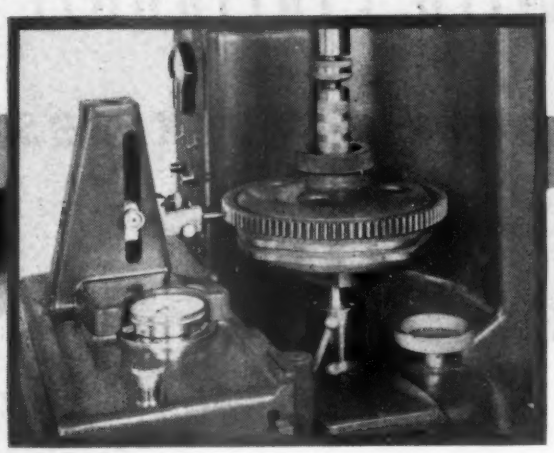
. . . if INVOLUTES ar

Fellows No. 12 Involute Measuring Machine with electrical recorder (the recorder is optional, but is generally recommended).

THE FELLOWS METHOD . . . MACHINES AND TOOLS FOR

SK is Avoided

ES are *Tested!*



Fellows Involute Measuring Machines—two models, 12 and 24 inch capacity—will permit production to be held under control, and will discover inaccuracies before rejects pile up.

With such equipment you can:-

1. Check the accuracy of the profile and measure the extent of any departure therefrom.
2. Discover a high fillet, its height and position.
3. Check an undercut and verify that it does not shorten the line of action.
4. Check amount of tip modification and its distance down the profile.
5. Determine the base radius of a gear tooth, if unknown.

The value of this machine is further emphasized in the ease of setting-up and operating. No tapes, no base rolls, no sine bars, no extra calculations. The Fellows dial indicator reads direct, and automatic charting is a complete visual record. For details write: The Fellows Gear Shaper Company, Springfield, Vermont—616 Fisher Bldg., Detroit 2, or 640 West Town Office Bldg., Chicago, 12, Illinois.

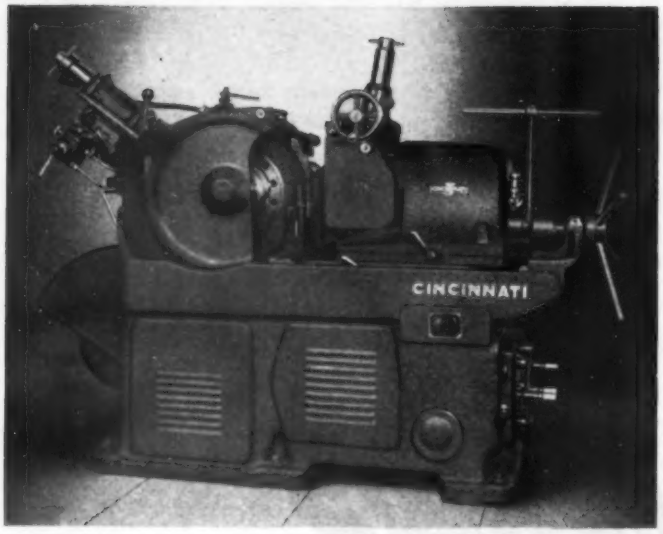
Fellows

FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI

CENTERLESS GRINDING THIN DISKS

. . . with Cincinnati engineered work rest



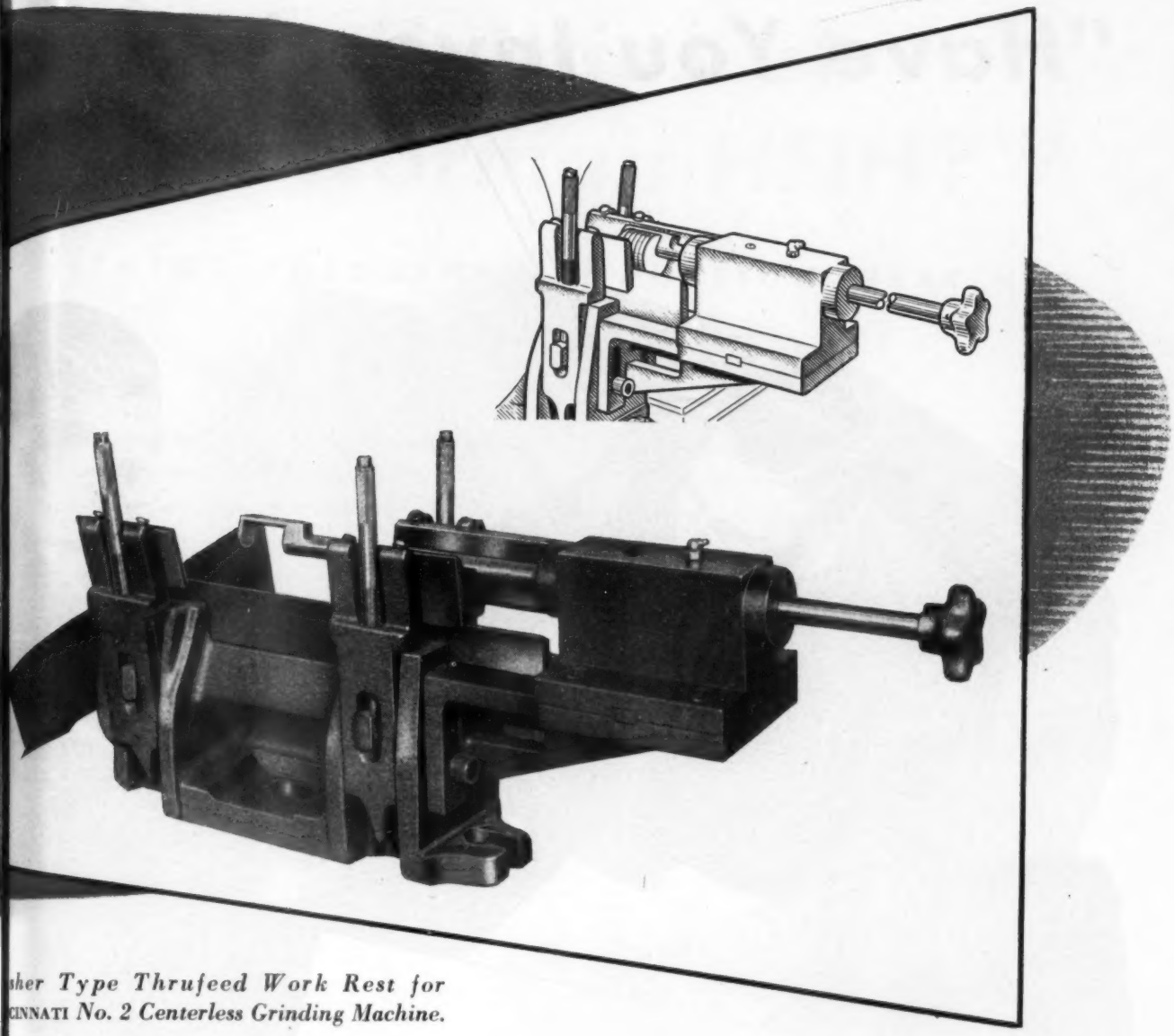
Left: CINCINNATI *No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete information. Send for a copy today.*

The use of CINCINNATI engineered Pusher Type Thrufeed Work Rests has increased the production of countless thin parts made of wood, glass, plastics, carbon, porcelain and all kinds of metal and metal substitutes. One example: Steel Cam Rollers, 5/16" wide by 1-1/2" outside diameter were ground at 500 per hour within a roundness tolerance of .0001", using the Pusher Type Work Rest shown above.

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES



sher Type Thrufeed Work Rest for
CINNATI No. 2 Centerless Grinding Machine.

ner Type Prior to the centerless operation, the parts
the pro- surface ground on the sides, so that when
of wood ked end to end the outside diameter will
all kinds ground exactly square with the sides. In
example: retracted position of the plunger, six pieces
1/2" out- loaded in the "clip" at the end (one work
per hour guide is much shorter than the other to
1", using litate the loading operation). The work is
n above n pushed manually between the wheels, automatically falling into a chute at the rear. The plunger is then retracted and reloaded. ¶ There may be a place in your shop now, or in your postwar plan for this type of work rest applied to a CINCINNATI No. 2 Centerless Grinding Machine. The engineers here at Grinding Headquarters will be glad to talk to you about this possibility. Send for catalog G-456-1 or look in Sweet's Catalog File for a brief description.

ATRINDERS INCORPORATED

CINNATI 9, OHIO, U. S. A.

ACHINERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

"Have You Investigated th

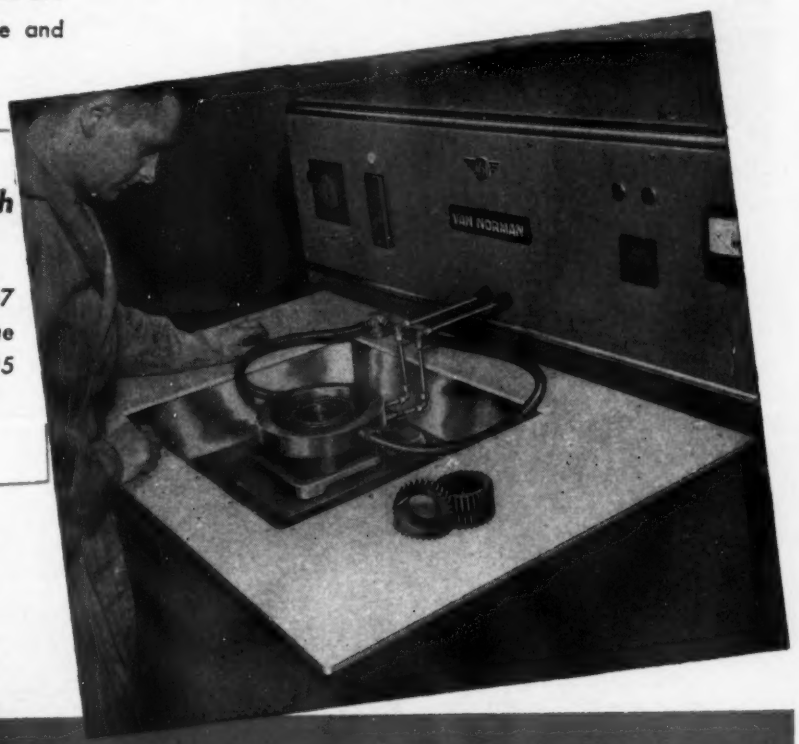
It Pays to

...the Possibilities of Van Norman HFIH?*"

(*HIGH FREQUENCY INDUCTION HEATING)

Because Van Norman High Frequency Induction Heating speeds up production, cuts costs, and provides a better finished product — more and more design engineers, production engineers and plant executives are turning to High Frequency Induction Heating for surface hardening, brazing, soldering, and a host of other heating applications. The reason . . . High Frequency Induction Heating provides quick, localized heat to a specific portion or area of metal. This not only simplifies heating operations but also saves considerable time. In fact, many heating jobs are completed in seconds as compared to hours when previous methods are used. In addition, warping, distortion, scale and straightening operation are minimized or entirely eliminated. And because the entire heating operation is automatic, Van Norman High Frequency Induction Heating eliminates chance of human error — thus part after part is turned out with identical characteristics. A typical surface hardening application is shown below.

Yes, you, too, can profit with HFIH. So investigate Van Norman High Frequency Induction Heating today. A complete story of their advantages, possibilities and applications will be sent on request. Write for your copy.

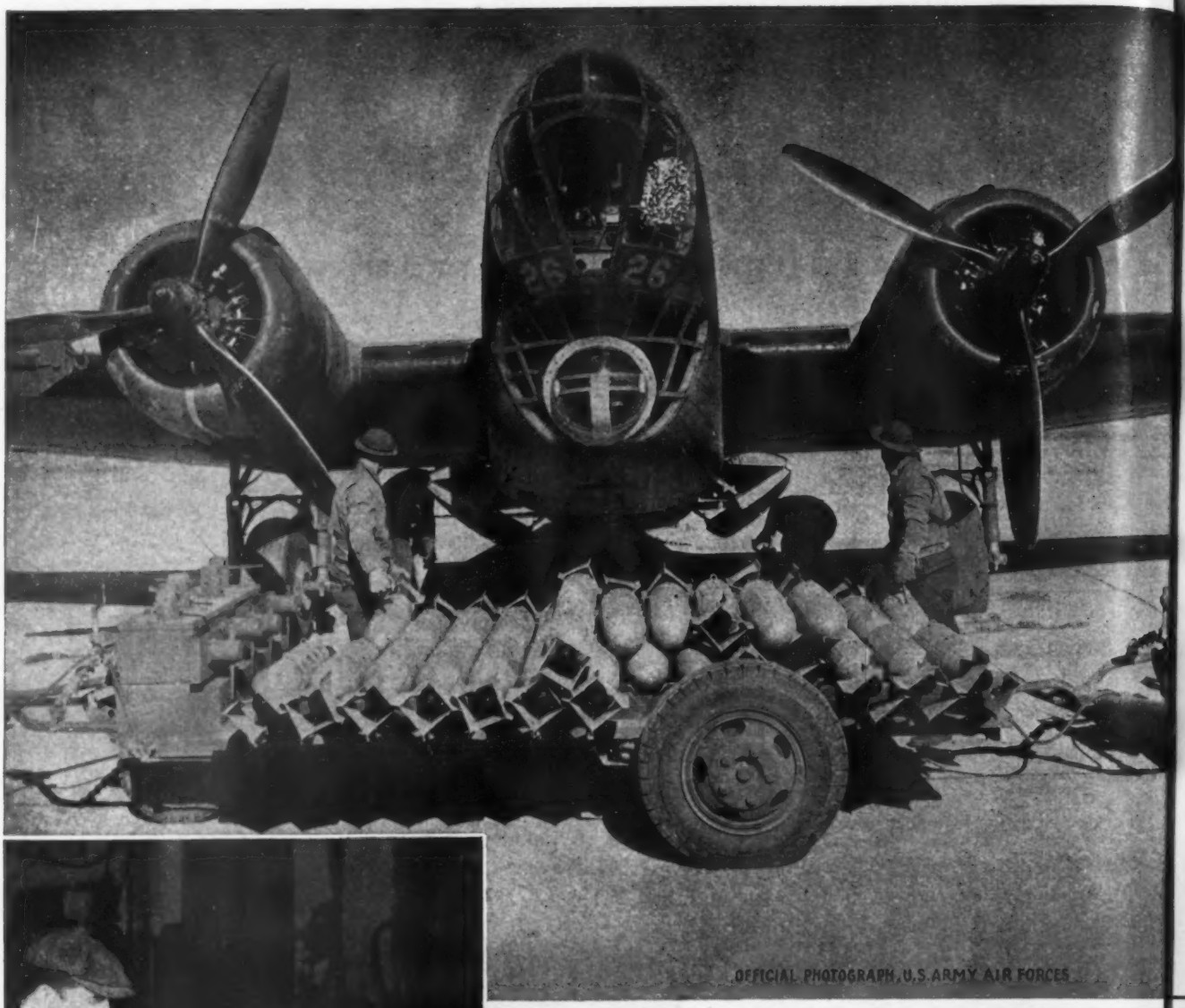


Surface Hardening Gear Teeth in 23 Seconds

Gear teeth are hardened to 55-57 Rockwell C in 15 seconds. Quench time is 8 seconds. Depth of hardening .035 to .045. Material-plain carbon steel.

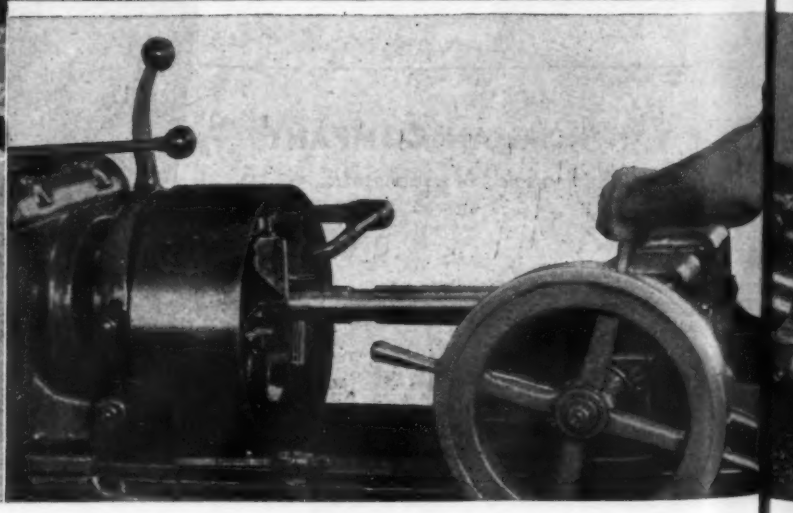
VAN NORMAN COMPANY
Springfield, Massachusetts

...to Van Normanize



OFFICIAL PHOTOGRAPH, U.S. ARMY AIR FORCES

LANDIS



For high production and accurate threading of vital components used in the manufacture of war material, Landmaco Threading Machines and Landis Die Heads are setting new performance records.

(Threading Problems in War Production Solved by LANDIS Engineers)

Landis Threads Now Open Bomb Doors in a Jiffy ....

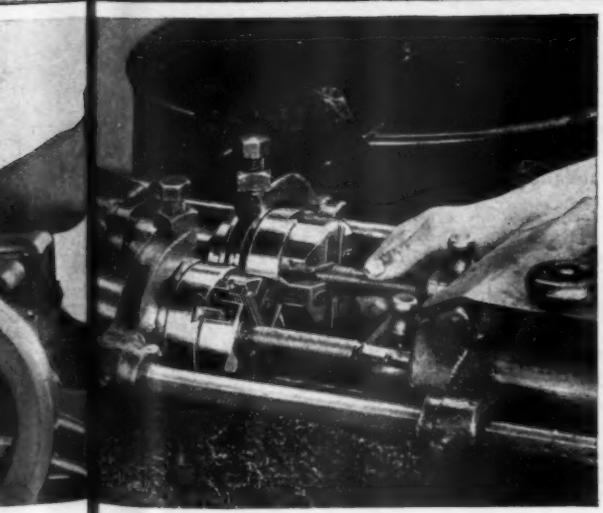
The doors of the bomb bay must function quickly and unfailingly to assure success when the objective is sighted.

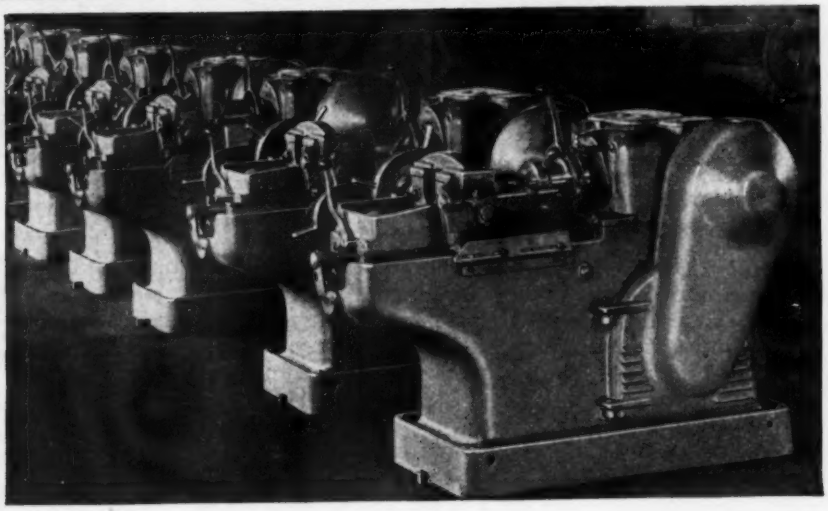
To guarantee smooth, precise operation of the bomb doors, one manufacturer of heavy bombers employs a Landmaco Threading Machine to cut the long acme double thread screws required to perform this vital operation. The threads must be held to close tolerance specifications and must have a smooth, unmarred surface.

The Landmaco Threading Machine, in the words of this manufacturer, has "more than met these specifications"!

Write for Bulletin No. H75
Descriptive of the Landmaco Threading Machine

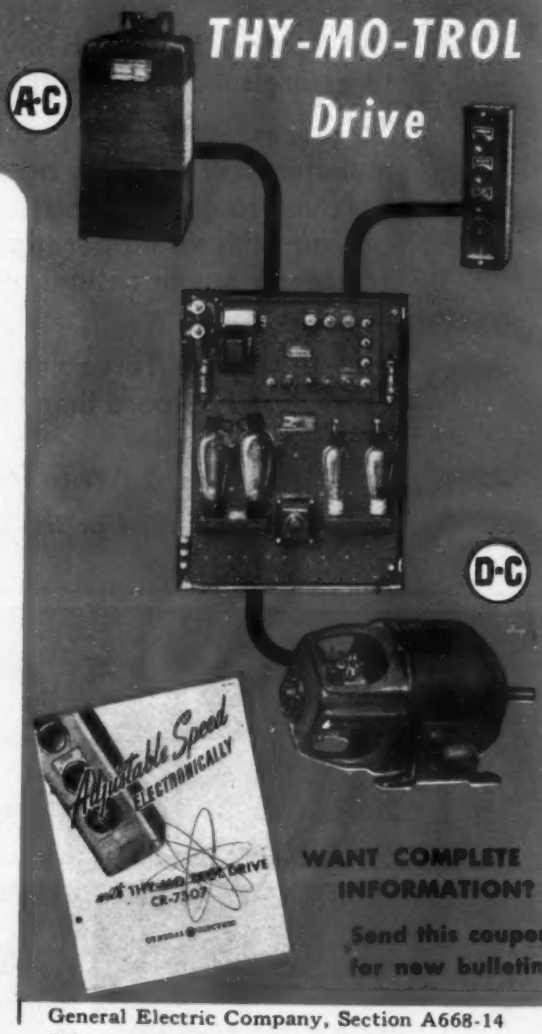
S MACHINE CO. WAYNESBORO PENNA. U.S.A.





CONSTANT SPEED EVEN WITH CHANGING LOADS

--ANOTHER Advantage of THY-MO-TROL Drive



What it means to machine users

MAINTAINED PRODUCTION because the speed of the motor does not fall off appreciably as the load on the machine increases.

IMPROVED QUALITY OF WORK because Thy-mo-trol drive provides the *correct operating speed*, and holds it.

NEED FOR GEAR CHANGING OFTEN ELIMINATED because Thy-mo-trol drive makes possible a wide speed range—ratios of 100:1 or greater can be provided.

ACCURATE SPEED CONTROL. Speed is held constant at the level the operator selects for each operation needed.

Standard Thy-mo-trol drives hold speed very closely, even though the load varies from no load to full load, because the electronic circuits automatically compensate for the voltage drop within the motor (which varies according to the load). For example, if the compensation adjustment is set for flat speed regulation at 10 per cent of basic speed, the regulation will be within 2 per cent when the drive is operated at basic speed (assuming constant motor temperatures).

When regulation better than that provided by the standard Thy-mo-trol drive is required, the addition of a tachometer generator affords speed regulation within one-half of 1 per cent.

A COMPLETE DRIVE. Thy-mo-trol drive takes a-c power from your supply line and, through its d-c motor, delivers torque to your load over a wide range of speeds. Starts, accelerates, controls speed, stops by dynamic braking, and reverses the motor—all from a single control station.

Standard drives can be obtained in ratings from $\frac{1}{8}$ to 15 hp—higher or lower if needed.

HOW TO BUY THY-MO-TROL. Just give our local office complete information about your requirements—nature of the load, speed range, horsepower, etc. Then, our engineers will select just the right Thy-mo-trol drive components, to give you exactly the operating characteristics you want.

BUY WAR BONDS

GENERAL ELECTRIC

WANT COMPLETE INFORMATION?

Send this coupon for new bulletin.

General Electric Company, Section A668-14
Schenectady 5, N. Y.

Please send me a copy of Bulletin GEA-4025, which tells what Thy-mo-trol drive will do, what it has done, and how it works.

Name .....

Company .....

Address .....

.....

8930

Meet "Flash" Jonesey, champ of the soap box derby. He built that job with his own two hands and his old man's basement tools. . . . He's the great American dream, and the hope of this cockeyed world.

For it's because America raises kids like Jonesey that America is winning this war. Kids who were weaned on mechanical toys, and cut their eyeteeth on tools. Kids who grew up to be the finest fliers and fighters, engineers and builders the world has ever seen. . . . And it's because of millions of kids like Jonesey that America will have a priceless legacy of the world's finest skills, after this war is won.

The responsibility to use those skills wisely and well is one of the greatest industrial challenges ever to face this nation.

If you are a manufacturer, there is one thing that you can do at once: Have your production men and planners consult now with the engineers of the basic machine tool producers. They can help you in planning ahead the difficult task of reconverting your own skills and machinery to an all-out peacetime production.

One of these engineers is a Bryant man — and his specialized knowledge of internal grinding machinery is important to the manufacture of literally *everything* that will mean jobs and prosperity after the war . . . that will make America's priceless legacy a new hope for the world.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U. S. A.

Numerous factors make for easy grinding machine operation.

As many machine movements as possible must be automatically, rather than manually, controlled. That relieves the operator, thereby reducing fatigue or stepping up production or both.

All controls and adjustments must be of such a nature as to enable the operator to quickly make positive settings. He must feel sure of himself—know, for example, that the tenth graduation on the feed-up handwheel means just that.

Machine movements which have to be manually operated from time to time must be easy, thereby requiring the minimum amount of effort on the part of the operator. Again, operating fatigue is reduced.

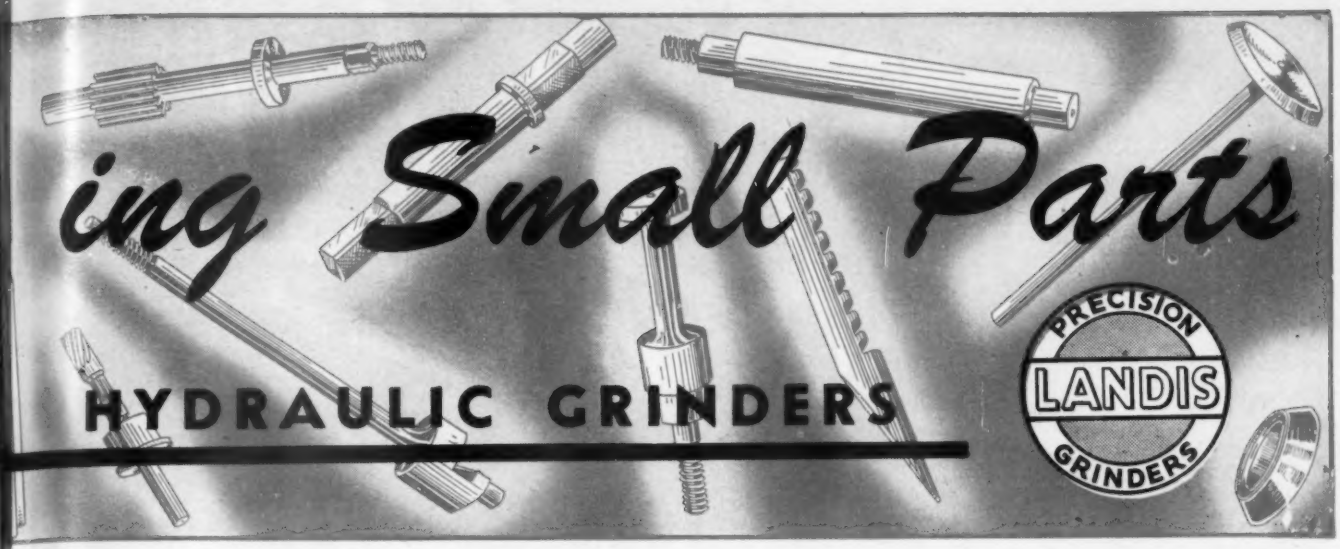
The Landis 4" Type H Plain Hydraulic Grinder meets the foregoing requirements. Everything practical has been done to relieve the operator, yet speed up production. Nothing could be plainer than this fact after checking the six briefly described examples on this and the opposite page.

430

1 The 4" Type H, when supplied with the hydraulic straight infeed mechanism, has two complete grinding cycles built into the machine. The ease with which it is possible to switch over from the straight infeed cycle to the traverse cycle or vice versa is a revelation. Merely turn a single knob.

2 The Landis Tool wheel reset mechanism eliminates a very common cause of work spoilage. On most precision grinders it is necessary for the operator to back off the wheel by hand at the end of each cut. On the Type H the wheel is automatically reset upon the conclusion of any of the grinding cycles.

Unusual Performance as Usual



3 All electric controls are grouped at the left-hand side of the bed in front. A master start button also serves as a work jog and a master stop or safety button is provided. Selector switches enable the operator to stop coolant flow during the setting up of the machine and to provide coolant flow during the dressing of the wheel. A work speed selector is also located at the front of the machine.

4 The operator need never bother about starting and stopping work spindle rotation or coolant flow. Machine just does these things at the proper time in the cycle without his ever giving them a thought.

OPERATION

5 A large recess in the front of the bed gives the operator sufficient leg room so as to make him completely comfortable if he wishes to operate the machine from a sitting position. All controls are just as convenient from the sitting position as from the standing position. The large number of female operators now running these machines have found this feature particularly desirable.

6 Work having a superior finish is practically always demanded from the Type H. To secure a finish of this kind, the grinding wheel face must be very carefully dressed. An exceedingly slow table traversing speed is a necessity. The traverse reversing lever is provided with two stages either side of its center position. One stage is for traverse grinding, the other for wheel dressing. Both these speeds are adjustable and the switch over from one to the other is quick and positive. The wheel dresser is built into the footstock base, thereby further simplifying the dressing operation.

LANDIS TOOL COMPANY
WAYNESBORO—PENNSYLVANIA

. . . and you cannot escape it!

This "Frozen-Action" photo pictures a force that is shaping the destinies of all mankind — now and for generations to come.

To our enemies it is a dreadful secret force that will one day bring them crying to their knees. Secret to them . . . because they have never fully understood it. Their warped minds could not possibly realize the extent to which American industry has mastered *the art of cutting and working metals on a vast scale.* Our enemies can neither equal nor escape this force — bred by generations of free enterprise.

To Americans, this force is the secret which has brought about the highest standard of living the world has ever known. When peace comes, it will be a key factor in building a better world.

Our picture shows Pratt & Whitney milling cutters at work. And there's a secret *here* — too. If you already use Pratt & Whitney small tools you know about it . . . about their keen cutting edges, long life, and dependability. If you are not yet a user of these fine tools — now is a good time to find out how they can help cut your costs in the highly competitive civilian production days which lie just around the corner. Get in touch with the nearest P&W branch office, where you will find expert engineers ready to co-operate by offering sound, economical solutions to your metal working problems.

Shown are two Pratt & Whitney plain milling cutters at work. The line of top quality small tools made by Pratt & Whitney includes a complete line of TAPS, DIES, REAMERS, GEAR CUTTERS, MILLING CUTTERS, DRILLS, ARBORS, PUNCHES, THREADING TOOLS, METAL SLITTING SAWS . . . and many others. Each one is made to the well known Pratt & Whitney standard of accuracy.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

FOR GENERAL PURPOSE PLAIN CYLINDRICAL GRINDING . . . FITCHBURG *shows the way to increase production and cut costs*

6-inch Type "B"—The Fitchburg Type "B" 6-inch automatic precision grinder features new engineering principles that result in more economical and faster production of plain cylindrical parts. Made with 18" and 32" maximum capacity between centers.

10-inch Type "B"—The Fitchburg Type "B" 10-inch plain cylindrical automatic precision grinder also incorporates engineering features that result in more economical and increased work production, greater accuracy, and finer finish. Made with 18", 48" and 72" maximum capacity between centers.

Type "C" Adjustable Angular Head Grinder—The Fitchburg Type "C" Angular Head grinding machine is a single application of the Fitchburg Standard Bowgage Wheelhead Unit. It is designed to handle a wide range and a number of types of jobs. The Bowgage Unit is mounted so that it may be located to grind 0 degrees up to a 45-degree included angle. Prompt deliveries can be made. Mail coupon today.

Please mail the catalog checked.

6" Type B ☐ 10" Type B ☐ Angular Head ☐

NAME _____ TITLE _____

COMPANY _____

STREET _____ STATE _____

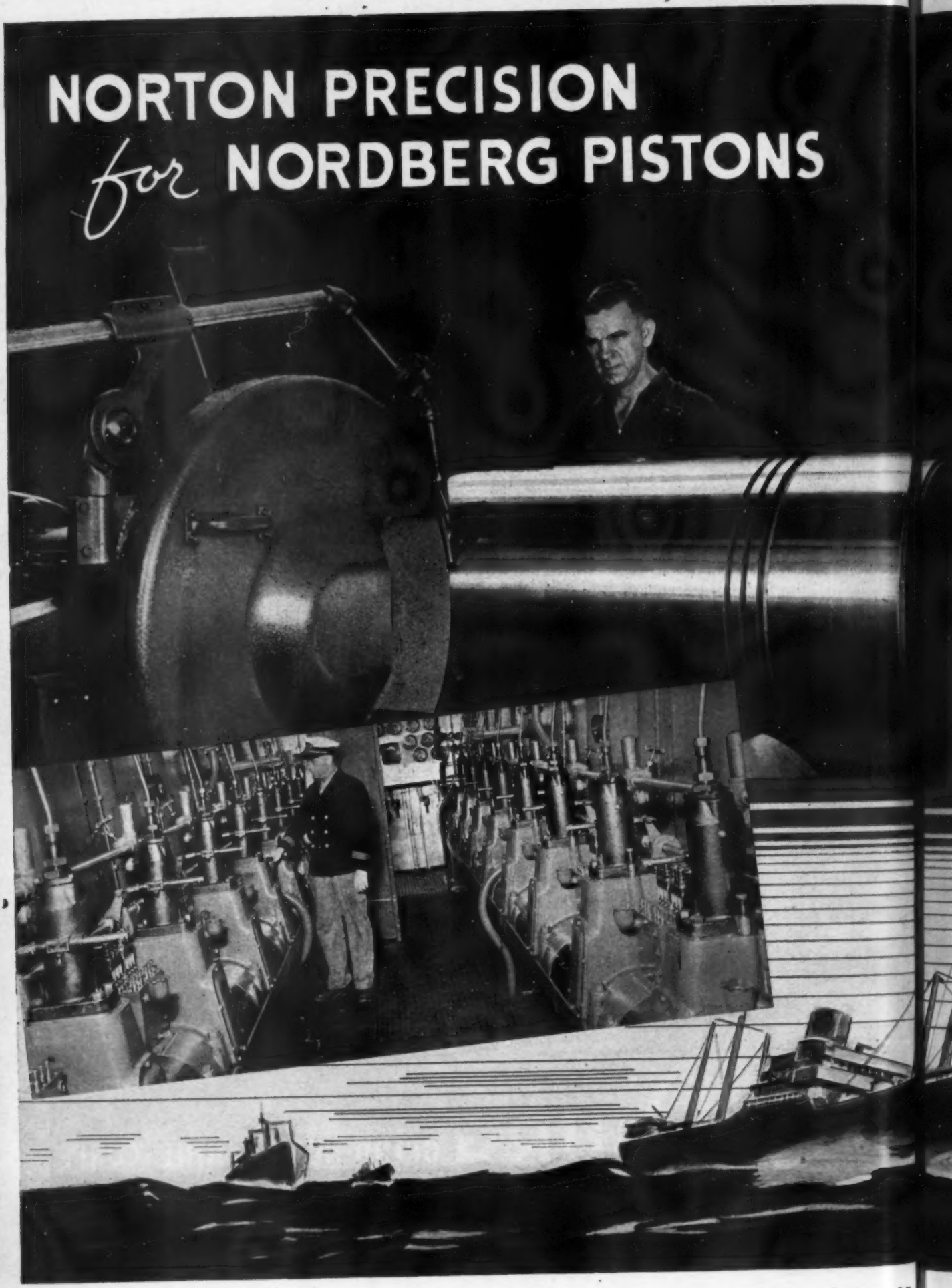
CITY _____ A. M.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

NORTON PRECISION *for* NORDBERG PISTONS



Powerful Diesels speed ships on vital supply lanes

THE present global war is termed a battle of supply lines. Feeding these supply lines — traveling the sea lanes of the Atlantic, Arctic and the Antipodes — are American ships driven by Nordberg Diesels. Every propeller beat — every stroke of the mighty pistons — brings our day of Victory nearer.

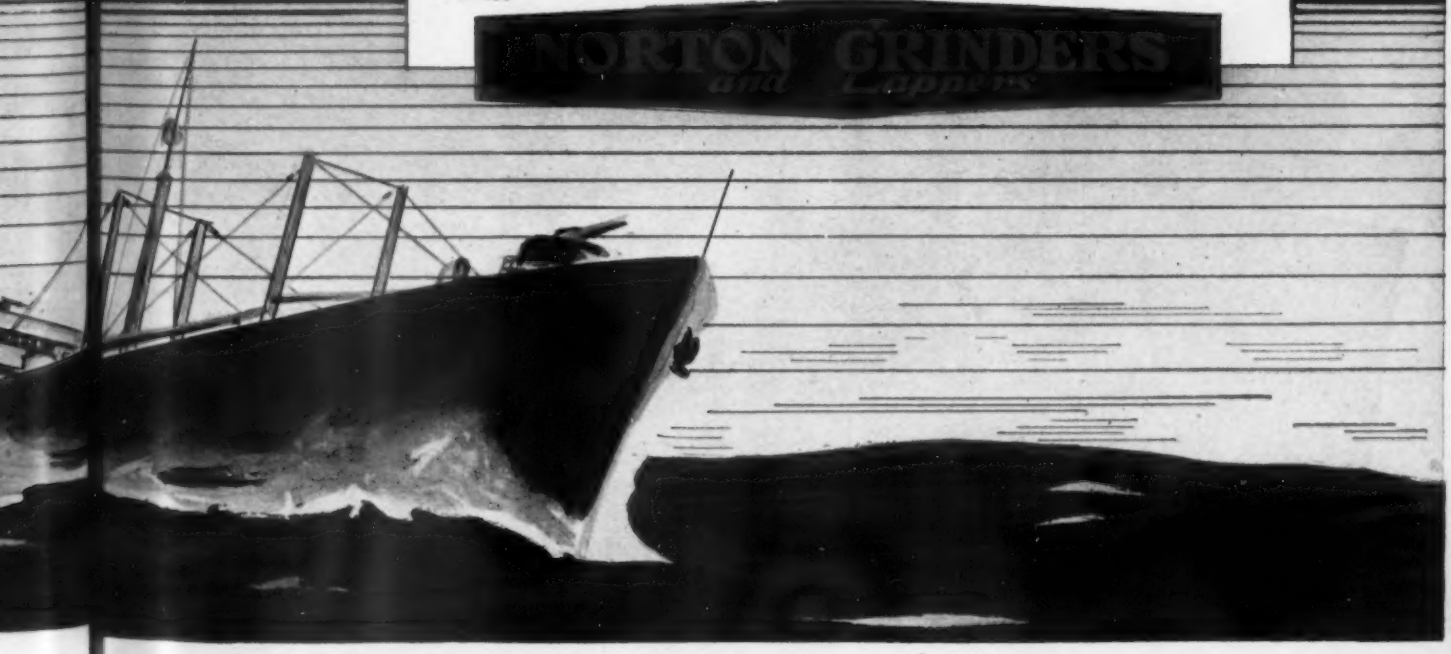
Rated from 2000 to 6000 shaft horsepower, the giant engines produced by the Nordberg Manufacturing Company challenge the imagination. Huge machine tools, some of the largest in this country, turn out two-cycle Diesels not only for C-1 and C-2 cargo ships but also for capable 17-knot Victory ships, and for the U. S. Navy itself.

Pistons which drive these American ships toward our far-flung fronts are finished on Norton Grinders. Rigid standards of craftsmanship and precision, premised on the finest in machine tools, assure long and efficient life for these Nordberg engines — a life which will serve us all well in coming days of peacetime rehabilitation — for these ships will be a nucleus and the backbone of a new-born American Merchant Marine fleet.

NORTON COMPANY, WORCESTER 6, MASS.

M-480

NORTON GRINDERS and Lappers



SAVE 75%

The Monarch-Kelly Shape Turning Machine is reproducing the mold for a glass dish. This is one example of the many intricate shapes and contours which this machine produces fast, accurately and economically.

THE MONARCH MACHINE

% PRODUCTION TIME

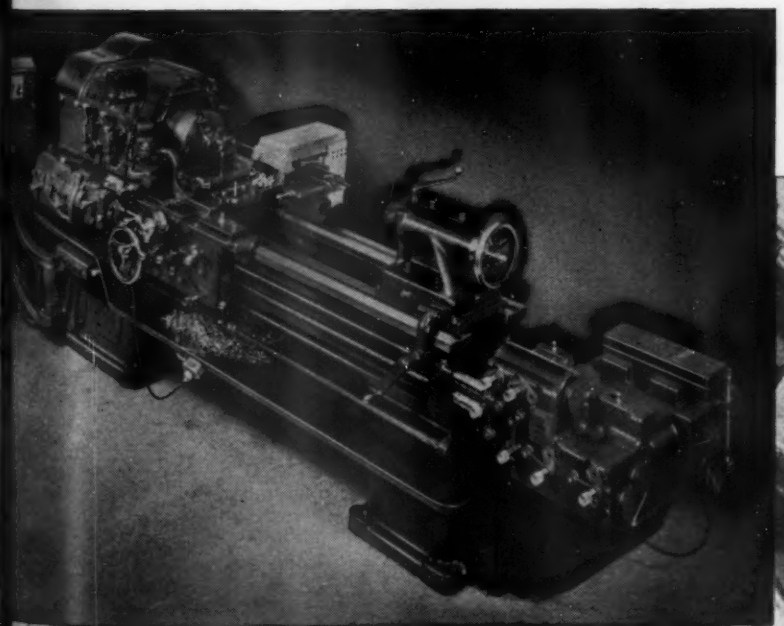
with Monarch-Kelly Shape Turning Machines

Mechanically perfect shapes, in any quantity, and in almost any form or contour, can be produced on the Monarch-Kelly Shape Turning Machine from four to five times faster than by other methods. This has been proved by our customers who have been using these machines since before the War.

A master shape cam (which can be used for thousands of different shapes) produces round, oval or other shapes. In the same operation, Monarch-Keller electric controls reproduce the desired contours from thin metal templates. For one set of dies, molds or shapes or for a quantity, you can save time and reduce costs with the Monarch-Kelly Shape Turning Machine.

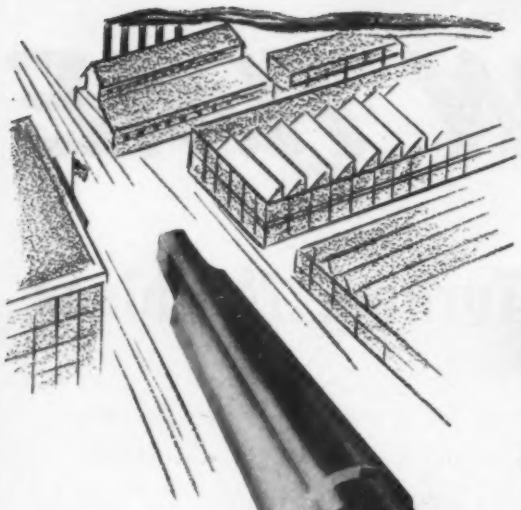
If you have turning, boring or facing work of irregular contour or shape, which is difficult to machine, Monarch engineers will study your prints or demonstrate with test samples the economy and precision of the Monarch-Kelly Shape Turning Machine. For those engaged in War Work, reasonably prompt deliveries can be made. Address our plant at Sidney, Ohio, or any of our convenient field offices.

MONARCH LATHES
Save Time



The Monarch-Kelly Shape Turning Machine was developed and successfully used in industry before the War, but was withdrawn from the Monarch line to allow vastly increased production of Monarch standard and toolmakers' lathes for the War Program.

NE TOOL COMPANY · SIDNEY, O.



OUT OF **VITAL PRODUCTION PROBLEMS**

CAME THIS NEW IMPROVED

PATENTED DUAL-SPIRAL

EXPANSION REAMER

It took this Hi-Speed Steel Expansion Reamer to break the bottleneck on tailfork production in a Mosquito bomber plant, and to ream accurate smooth holes on grooved surfaces in an automatic rifle factory. Other reamers didn't do these jobs — satisfactorily. Two blade segments spiral in a direction opposite to that of the third and shear a mirror-smooth finish on any machinable metal or plastic. Reams accurately, rapidly — easily.

- ★ *Adjustable for Size Instantaneously on the Job!*
- ★ *Makes Clean Holes.*
- ★ *Eliminates Costly Wear on Plug Gauges caused by Abrasive Left in Honed Holes.*
- ★ *Removable Blades are Easy to Resharpen.*
- ★ *Extension Pilots for Alignment Jobs.*
- ★ *.050" to .080" Straight Line Expansion**
- ★ *Reams Smoothly over Keyways and Split Bushings.*

* Sizes under 11/16" slightly less.

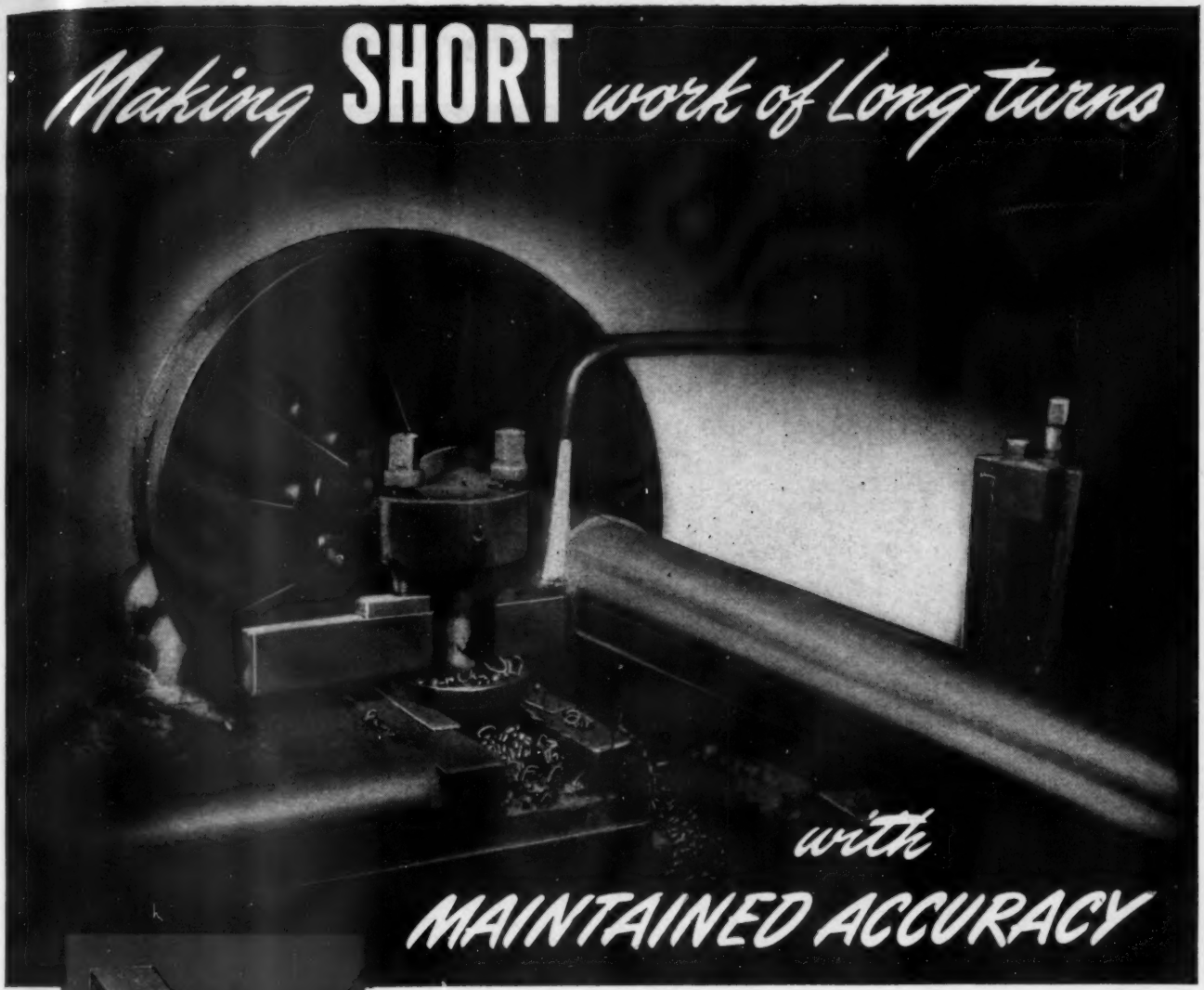
The Star on Lempco's "E" Flag is for Continued Outstanding Production.

WRITE FOR CATALOG

LEMPCO

5711 DUNHAM RD. • BEDFORD, OHIO, U. S. A.

Making SHORT *work of Long turns*



with

MAINTAINED ACCURACY

One of the complete variety of Kennametal tools available for lathe, boring mill, and milling machine operations.

The exceptional performance of Kennametal on long cuts works miracles in steel-cutting shops where taper is a bug-a-boo that means, at the best, expensive reworking and finish grinding, and at the worst, a high rate of rejections. Kennametal contains a unique intermetallic compound (tungsten-titanium-carbide) that gives it unmatched hardness. Used properly, it can remove stock from the toughest steel up to 3½ times more effectively than other carbides!

Our engineering staff knows and understands the amazing inherent characteristics of Kennametal and how best to apply them to any specific cutting job. There is an experienced field engineer in your district ready to help you select the right grade of Kennametal, and to determine the proper tool design and the most efficient machine set-up. When these factors are nicely balanced—Kennametal breaks production records!

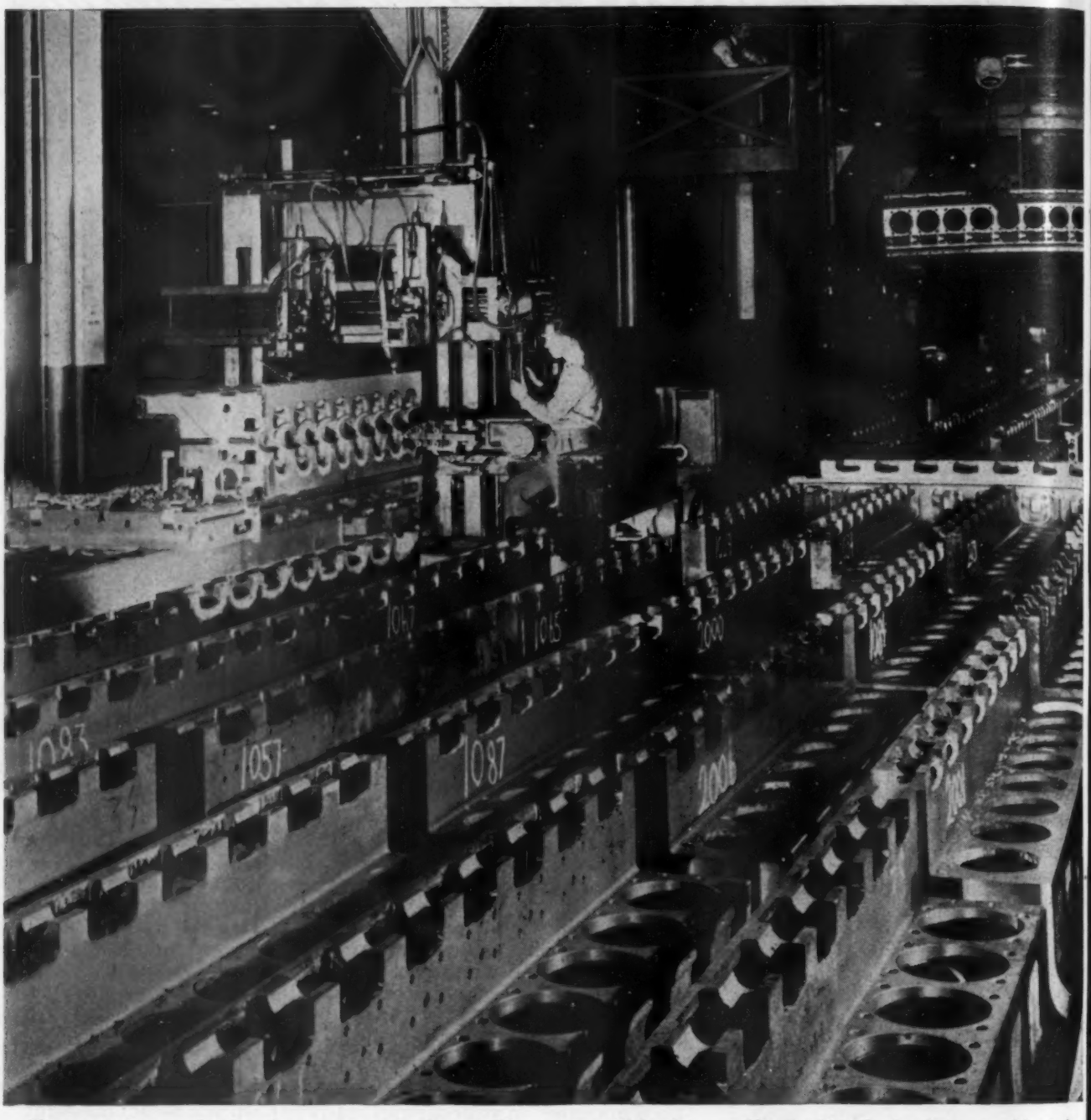
Get acquainted with Kennametal. Write for our descriptive Catalog 43-C that contains information on tool design, use, and maintenance.

KENNAMETAL

KENNAMETAL *Inc.*
103 LLOYD AVE., LATROBE, PA.

SUPERIOR CEMENTED CARBIDES

Diesel Engine Plants Prefer Hypro Planers



Planer operators are keeping the crane operators busy stacking finish planed cylnider blocks. The secret is the Cincinnati HYPRO Planer and two piece table arrangement.

The man you see in the picture can concentrate all his attention on planing the parts on the table while on the other section of the table, not shown, another man is setting up the next engine block to be machined.

Diesel engine cylinder blocks must be accurately machined to provide the performance war demands of them. Cincinnati HYPRO Planers provide this accuracy. They are ruggedly built with massive pyramid housings capable of taking the heaviest cuts without deflection.

HYPRO planers are driven by Herringbone gearing to assure a smooth even flow of power at a speed range from eight to 240 feet per minute. Numerous exclusive HYPRO fatures are embodied in the design of HYPRO-duction planers.

Post war planning demands the most efficient and modern machine tools. Write for Bulletin 136 illiustrating why Cincinnati HYPRO Planers are the machine tools for your shop and the future.

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

There are many GOOD THINGS AHEAD . . .

Transparent plastic cells will make easier the checking of storage battery solutions.

A new coating for metal is claimed to have five times as much resistance to salt spray as galvanizing.

A chemical substance, added to hard nickel alloys, is claimed to save 75% of machining time.

With the promise of an infinity of electronic tube applications, the effect of their radiation on humans is being carefully studied. There seems to be no evidence of ill effects from even long exposure.

The new thyratron motor control, which makes possible the operation of D. C. motors from A. C. current supply, is said to permit exact variations in speed from 25 to 1,750 r.p.m. by the turning of a graduated knob.

Many new kinds of ink have been developed for war needs, including one that is oil-proof which is used to print instructions on mechanical parts. Another prints the lines on gun sights and surveyors' instruments for which spiders' webs were formerly used.

A new series of plastics containing silicon has very great resistance to heat.

The old "lost wax" process of casting, long a method of jewelry manufacture, has been revived for the making of small, complex mechanical parts.

A small section of Connecticut highway is being paved experimentally with steel mat similar to that used for quick construction of landing fields and on invasion beaches.

A new high-speed X-ray inspection machine is claimed to be capable of photographing as many as 17,000 castings per hour on a continuous film.

A new landing gear, for aircraft, works on the caterpillar principle, and is said to be lighter than the conventional wheels with from four to eight times the supporting surface.

A new cement that may be applied with a brush and set with a flat iron is claimed to bond metals with a strength and permanence equal to spot welding.

In one of the trickiest of new finishing processes, the sprayed paint coats one side of an object and, after passing by it, turns around and returns to paint the other side.

Broken drills and reamers are being removed from holes with dynamite.

A new 120-inch searchlight, with 900-watt mercury light source, develops 7,500,000 candle power.

So many uses are anticipated for glass fibers that they are being produced in seven standard types. Their fibers are now being used in making filters and insulation, for reinforcements in felt, paper, plastics and alone, or in combination, with cotton, rayon or asbestos in textiles.

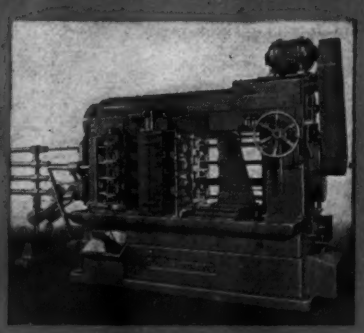
A new method of checking liquids during processing depends on the observation of color by a photoelectric colorimeter.

Aircraft piston rings finished with oil-retaining, porous chrome plate are reported to increase by five the flying time between overhauls.

A new "wide-angle photo-electric scanner" is offered as an inspection or safety device. While the work that it does is similar to that done by more familiar applications of the "electric eye", the new device scans the whole of an area, such as a sheet of paper or the space in front of a machine. Any change occurring in the area produces a reaction that may be used to give a warning signal or shut off power.

When you think ahead, think of production like this

These four tension bolts are all made at once, automatically, in twelve seconds — three seconds each — on the one-inch 4-spindle Vertical Conomatic. Production like this has helped America to overcome the time advantage of its enemies in war, and will help American manufacturers to overcome competition in time of peace.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

ARMSTRONG

Use the Correct ARMSTRONG TOOL HOLDERS—*the proper sizes and types*

There is a correct ARMSTRONG TOOL HOLDER for each operation on every lathe, planer, slotter and shaper and for standard operations on turret lathes and screw machines. Each is the most efficient tool obtainable for that specific job—has been painstakingly designed, tested, refined and perfected to hold the cutter at the most efficient cutting angle, to give the maximum tool clearance, greatest visibility and convenience, the proper rigidity or resiliency, and always, strength beyond any possible need—the strength to stand for years of continuous operation at the greatest speeds and heaviest feeds machine tools can attain. With the correct ARMSTRONG TOOL HOLDERS obtainable from stock at your local Mill Supply house, there is no need to operate under top efficiency, no economy in "getting by" with a wrong size or wrong type tool holder. Make it a rule to start every operation with the correct ARMSTRONG TOOL HOLDER—the right tool for the operation, the right size for the machine tool.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., N. Y.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

"We've found it!... A cutting oil that doesn't stain or foam"

875-MARATHON C-16 CUTTING OIL ELIMINATES STAIN AND FOAM... CUTS DOWN REJECTS... STEPS UP PRODUCTION

IF YOU THOUGHT stain and foam were something you'd just have to put up with in an effective cutting oil... Marathon C-16 is due to open your eyes. *Wide.*

For Ohio Oil research has produced a cutting oil that not only eliminates these two enemies of efficient production...but that also assures finer finish, longer tool life, lower temperature operation and higher cutting speeds.

On thread grinding, you can count on Marathon C- 6 for increased wheel life, superior finish, elimination of smoking and burning. Sounds like a big order for a grinding oil? It is. And Marathon C- 6 fills it. Get complete facts. Write or wire. Ask an Ohio Oil lubrication engineer to call.

ON AUTOMATIC SCREW MACHINES USE MARATHON C-16 IN GEAR BOXES, TOO

Leakage between gear boxes and cutting fluid then cannot impair the efficiency of the cutting fluid. In addition to its acceptance as a grinding oil, Marathon C-16 is widely used as a lubricating oil in gear boxes. Performing the dual function of a lubricant and a circulating oil, Marathon C-16 protects against damage to tools resulting from dilution of cutting oil with gear box lubricant.

A complete line of stainless, foamless cutting and grinding oils for every requirement.

THE OHIO OIL CO.

GENERAL OFFICES: Findlay, Ohio • DISTRICT OFFICES: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

MARATHON

PRODUCERS OF PETROLEUM SINCE 1887

DEPENDABLE SERVICE ON DIFFICULT JOBS

has been proved...

. . . IN "THE TOOLS YOU BUY AGAIN"

Consistent, proved performance of UNION TOOLS under every kind of condition eliminates any need for taking chances in the selection of small tools. You can safely take it for granted that the UNION LINE offers tools to meet your most difficult machining operations. Small tools bearing the name "UNION" are your assurance of speed, accuracy, long-life and economy. To use them is to prove their outstanding value in long, hard service.

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION TWIST DRILL COMPANY, Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div., Mansfield, Mass.; Butterfield Division, Derby Line, Vt., and Rock Island, Quebec.

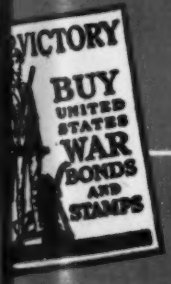
UNION

Easy Operation of P & J AUTOMATICS

. . . assures maximum production with minimum "woman-power" . . .

Adaptability of P & J Automatic Chucking and Turning Machines to operation by inexperienced workers has made it possible to employ many women as operators on these machines. Thus the manpower problem is being met and solved and production maintained at maximum in speed and accuracy.

Shown here is one of the many women employees in a well-known plant which produces a wide variety of small parts for the aviation industry. An entire battery of P & J 4D Automatics is handled by this female operator. Because of ease and convenience of operation, women and girls quickly learn to handle P & J Automatics skillfully and productively.

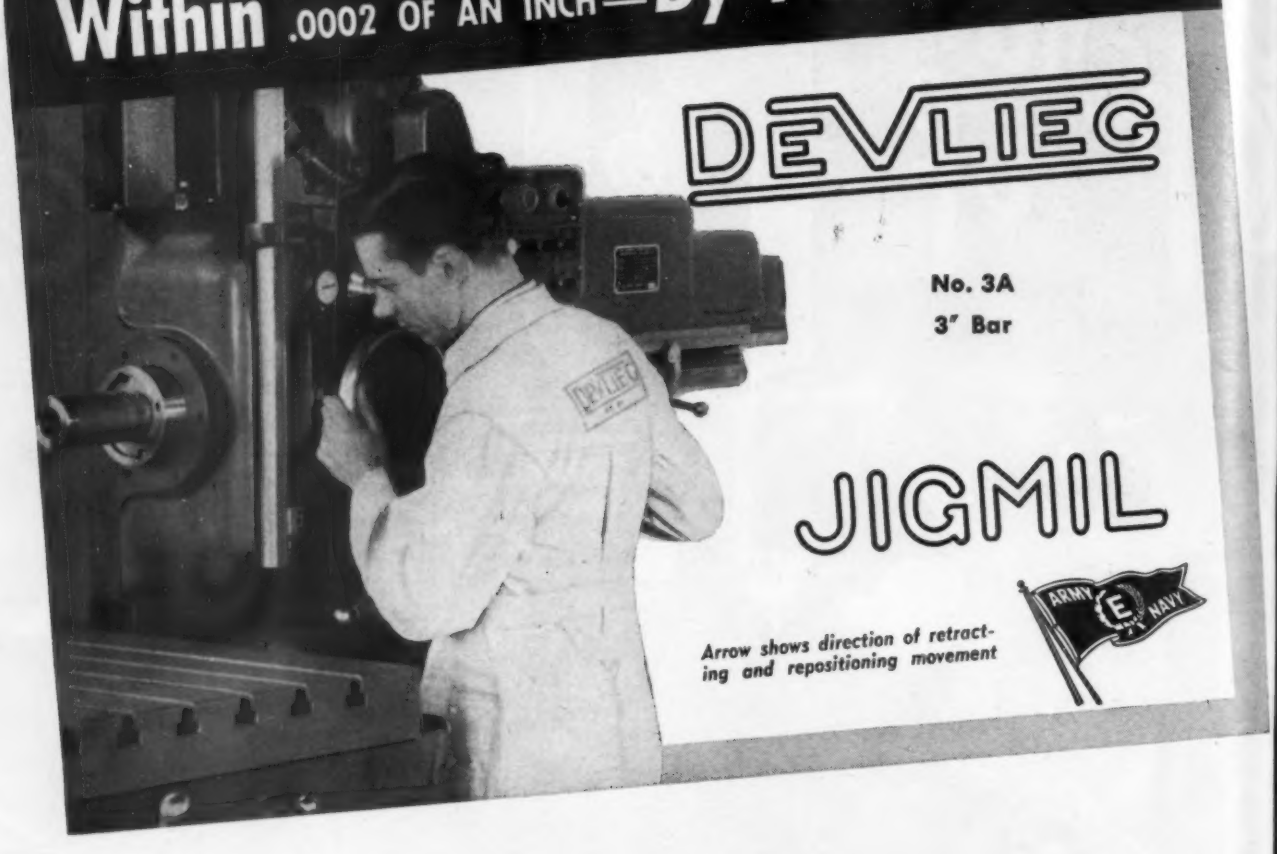


Hasten V-Day by making every Pay Day a Bond Buying Day . .

The POTTER & JOHNSTON MACHINE CO.

Pawtucket, R. I.

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DEVLIEG MACHINE COMPANY
450 FAIR AVE. FERNDALE 20, (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

THESE BARBER-COLMAN MEN ARE SOLVING YOUR CUTTER PROBLEMS

Perhaps the problem is how to increase production; how to combine several operations into one; improve finish; get greater tool life; or lower production costs. Whatever it is, it is being carefully analyzed to give you speedy help and satisfaction. The man on the right is a Barber-Colman field engineer. He has visited your plant, talked to you and your men, looked the job over on the spot. Many times, because of his experience, he might give you the solution right there. This time, however, he has brought the problem back with him to add further ideas.

As builders of production machine tools, we have had long experience with problems of how to make things better and faster. The benefit of this experience has been passed along to you before, in our hobbing engineering service. Now, we are going to offer you complete full-time consultation service on your cutting tool problems. The Barber-Colman field service has been expanded to offer this specialized help right in your own plant. When you are in trouble, when you want advice, or when you want to plan new things, call on this man and let him help you.

B-C ENGINEERING SERVICE

When we all convert to normal peace-time production again, there will be problems many-fold. There will be the question of new materials, new methods, new designs and new types of cutting tools. Which will be the best for your job? How can you get increased production in a shorter time and at lower cost? The purpose of this new extended service is to help you both now and when this time comes. Consult your B-C field engineer. He is ready to work with you.

Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Keep that guard up, America. * One opponent out means there's one left to beat. * We can only win by two knock-outs. * Meantime, the cannon, steam and diesel engines, heavy machine tools from General Machinery Corporation are in there punching.

GENERAL MACHINERY CORPORATION

GENERAL MACHINERY

CORPORATION

HAMILTON, OHIO

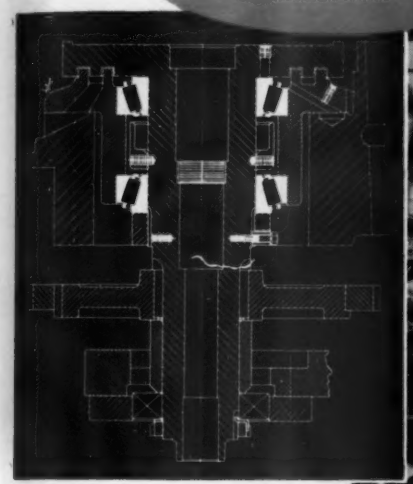
THE NILES TOOL WORKS CO.

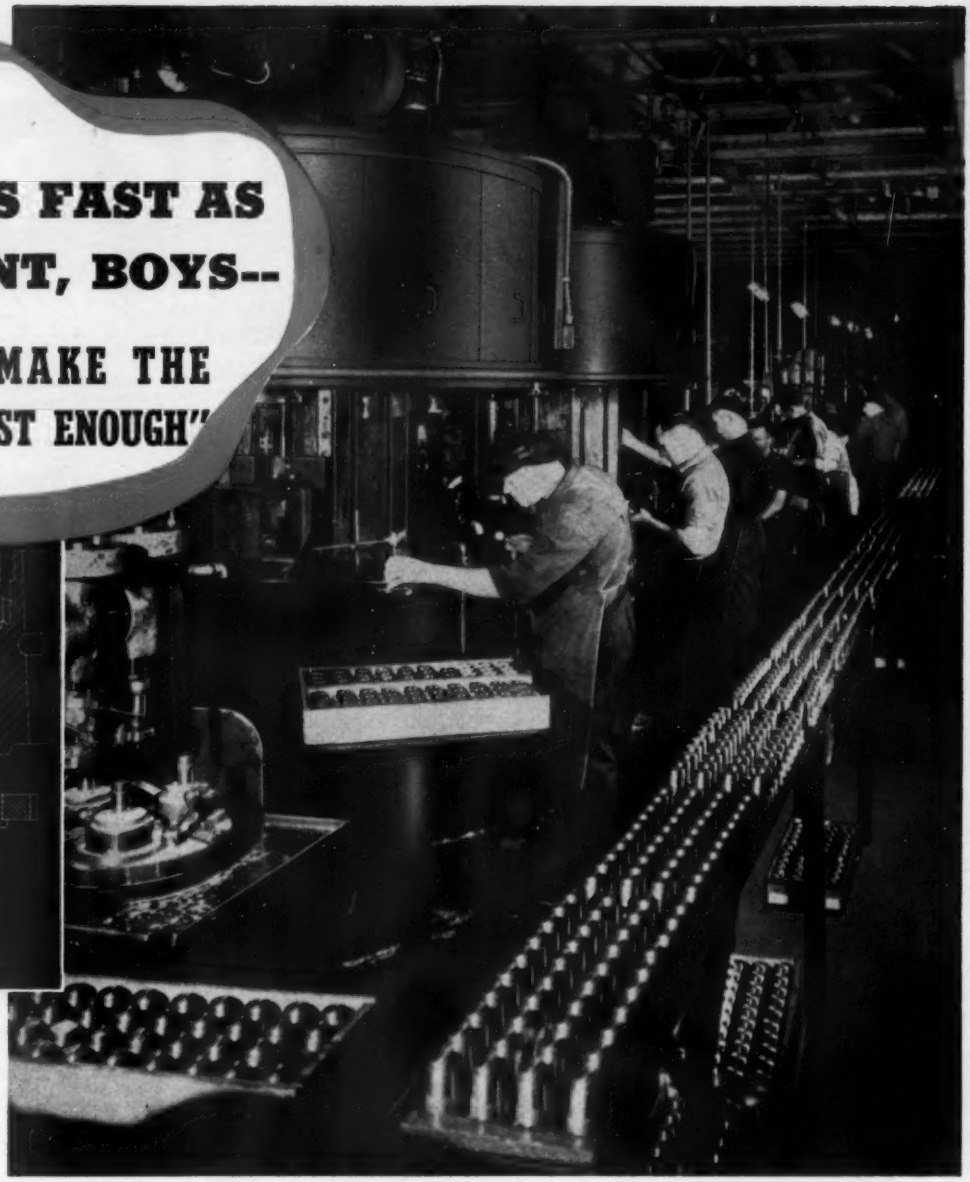
THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

"FIRE AS FAST AS YOU WANT, BOYS--

WE CAN MAKE THE SHELLS FAST ENOUGH"





Application of Timken Bearings on the spindles of Bullard Mult-Au-Matics.

THANK GOODNESS we can say that now! At last we are able to give our forces *unlimited* supplies of shells and war supplies of all sorts; we have the superior *machine power* that assures superior *fire power.*

A typical example of American industry's ability to out-produce America's enemies is the Bullard Mult-Au-Matic; a battery of these machines is shown in the photograph machining shells. With all 8 spindles mounted on Timken Tapered Roller Bearings, Bullard Mult-Au-Matics are capable of turning out a tremendous volume of work of the highest precision—and to keep on doing it day after day, month after month, year after year.

Throughout the machine tool industry — in heavy-duty machines of all kinds — Timken Bearings stand for top-notch performance; great endurance; economical operation; low maintenance. Insist on having them in your new machines. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

FOSDICK JIG BORER

meets rigid tool room requirements

ARMY (E) NAVY

● One of the outstanding features of the Fosdick Jig Borer is the extreme accuracy that is maintained and the low cost of production.

The ease of operation permits small lots to be handled quickly without the use of expensive jigs and fixtures. The simplicity of the machine enables the average drill press operator to perform accurate work on jigs—fixtures and miscellaneous production jobs.

The machine shown is used by Experimental Tool & Die Company to produce accurate tools and dies at low cost.

Being highly versatile it is an excellent machine for tool rooms and tool and die shops where a large number of distinctly different jobs are being run daily.

• IF YOU WANT •

precision work at the most favorable cost—investigate the Fosdick Jig Borer. Consult one of our nearby representatives or write for full descriptive bulletin Fosdick Jig Borer.—J. B. A.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI 23, ··· OHIO

SPECIFICATIONS:
1" collet capacity, 9" swing, 16" center distance, sixteen spindle speeds from 27 to 1750 r.p.m.

HARDINGE

High Speed Precision TOOL ROOM LATHE

When tool room collet work with one inch diameter or less is done on heavy lathes designed to produce large work, here is what happens—time is lost, machines lose money by under-capacity production, excess power is consumed for the work involved and floor space is wasted.

For profits proportionate to machine investment, use the proper size tool room lathe comparable to the work involved.

To have complete information on a precision machine designed for speedy turning, boring and threading, obtain a copy of our bulletin illustrating and describing the above unit.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

A PLACE IN THE SUN

MID-WEST honing and superfinishing stones, the world's most efficient abrasives, have earned their place in the sun for one predominant reason: THEY CAN BE DEPENDED ON TO DO THE JOBS FOR WHICH THEY ARE MANUFACTURED — AND DO THEM EFFICIENTLY.

MID-WEST engineers have maintained quality and dependability in MID-WEST honing and superfinishing stones by exercizing unusual care during the manufacturing processes — from selection of the raw materials to packaging the finished product. That care, coupled with MID-WEST'S extensive experience in the abrasive field, has ensured a product that cuts faster, cooler, smoother and more economically than anything else in its class.

MID-WEST honing and superfinishing stones perform better than ordinary abrasive stones because they are made with MICRO BOND, the remarkable new abrasive developed and manufactured by MID-WEST specifically for extremely close and superior finishing operations. Their speed, efficiency and economy will amaze you!

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Avenue **Detroit 11, Mich.**

"...GRINDING RESULTS NEVER BEFORE BELIEVED POSSIBLE!"

IMAGINE a grinding fluid so basically different, so advanced, that an entirely new approach to your grinding operations is necessary to take full advantage of its possibilities! Such a product is MICROGRIND #132. This new Quaker compound mixes with water to form a translucent coolant that makes possible grinding results never before believed possible!

The complete process built around MICROGRIND #132 embodies a new concept of wheel and coolant application and can be applied readily to *all* grinding, honing and superfinishing operations *with your present machines.*

If you are interested in—

Complete elimination of "pick-up", tears, burning, etc.;
Reduction of grinding checks to less than ½ of 1%;
Development of superfine finishes, free of glaze;
Elimination of 2 out of every 3 wheel dressings;
Increased wheel life . . . up to 300%;
Faster cutting;
Control of distortion;

you will want to learn all about this truly amazing new Quaker product.

A Quaker Process Engineer will gladly call and arrange to apply it and its attendant engineering right in your plant. Simply phone or wire our nearest office or use the handy request form below.

QUAKER CHEMICAL PRODUCTS CORP.
CONSHOHOCKEN, PA. Other Plants in CHICAGO and DETROIT
Warehouse Stocks in Principal Industrial Centers

QUAKER CHEMICAL PRODUCTS CORP. • CONSHOHOCKEN, PA.
☐ Please give me further details on this revolutionary grinding practice.
Name_____ Position _____
• • • PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW • • •

TO OBTAIN MORE DATA USE THIS HANDY FORM

Then he said to himself

"THIS WAR HOLDS UNPREDICTABLE DEVELOPMENTS"

FOR once Premier Mussolini was right when, just a year ago, he warned the Fascist Directorate that "This war still holds unpredictable developments, which will not all be on the political plane."

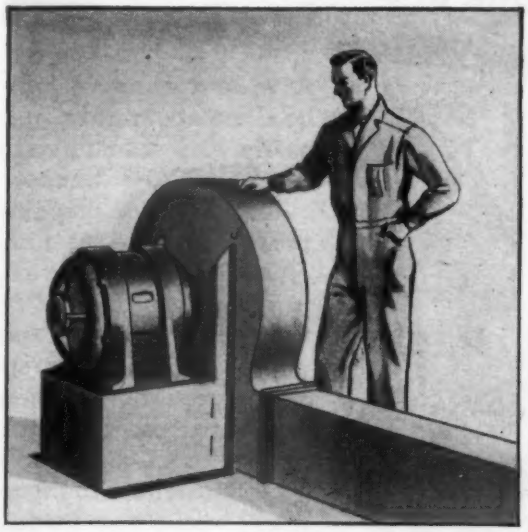
But there was enough on the "political plane" to slam his chin back in his collar, and if one wishes to read a moral into his statement, it could well be:

You always lead with your chin when you team up with the wrong working partner.

It is then you get unpredictable results of a DESTRUCTIVE nature.

"Unpredictable Developments" he says

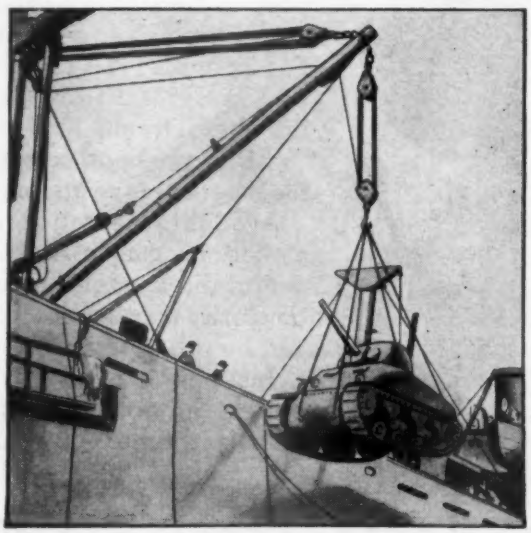
Look, Benito (*wherever you're hiding*), how men achieve predictable developments of a CONSTRUCTIVE nature when through recourse to Arc Welding they team up with a CONSTRUCTIVE partner:



MANUFACTURER A: Changed attrition mill fans from conventional construction to welded steel.

PREDICTABLE DEVELOPMENT: Lower cost. Better able to match design to each individual application.

CONSTRUCTIVE RESULT: Cut cost $108 per installation. Operates more smoothly. Consumes 25% less power. Steel fan blades don't choke up as did former blades.



MANUFACTURER B: Changed cargo ship booms from pipe to arc welded tapered tube.

PREDICTABLE DEVELOPMENT: Less material cost and less weight per ton of capacity.

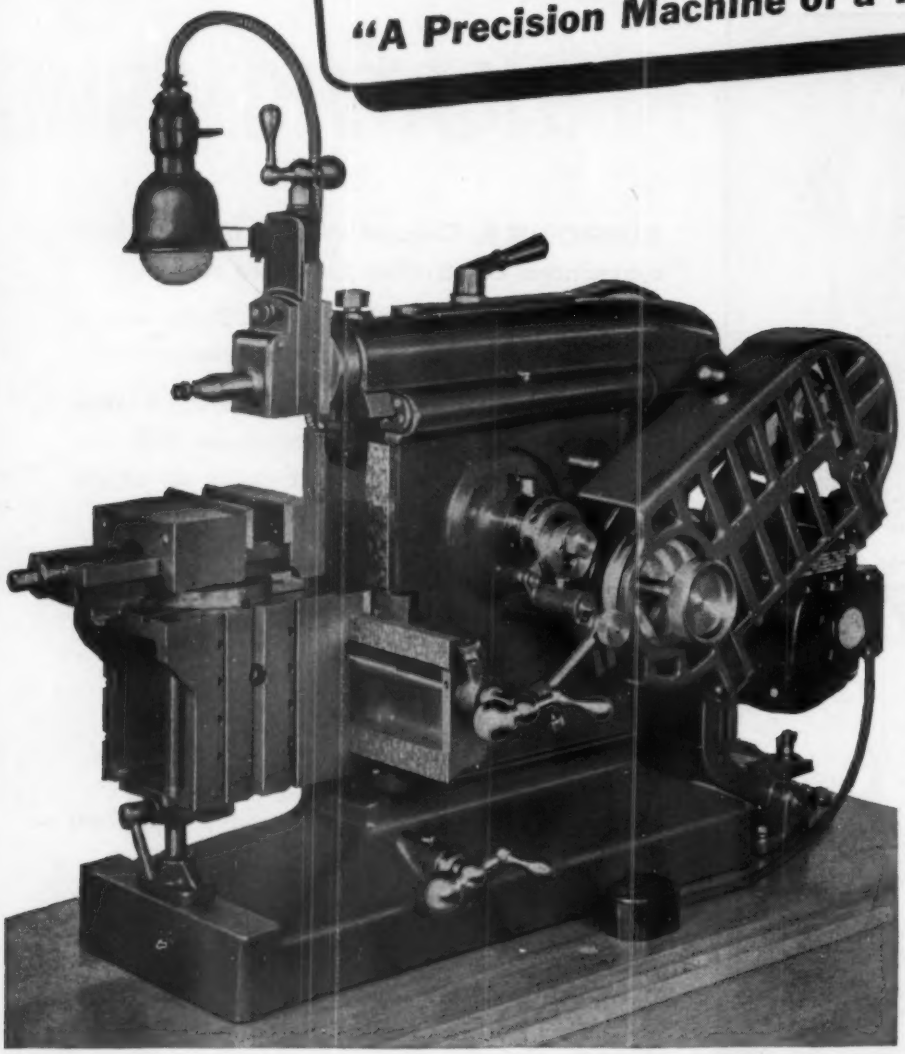
CONSTRUCTIVE RESULT: On 5-ton boom: Cut weight 16% from 1950 lbs. to 1628 lbs. Cut cost $40 per boom.

THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

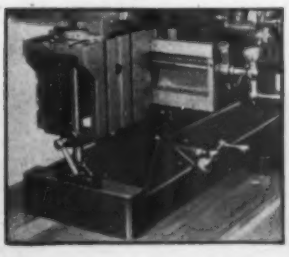
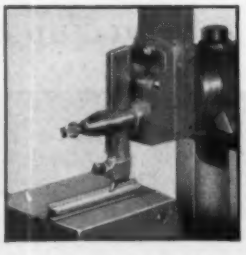
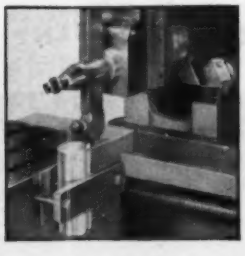
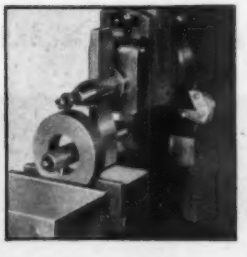
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

Available for stationary installation or as portable unit ...Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job ...Just plug in to an electrical outlet, and go to work. Saves steps and time.

★

Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable

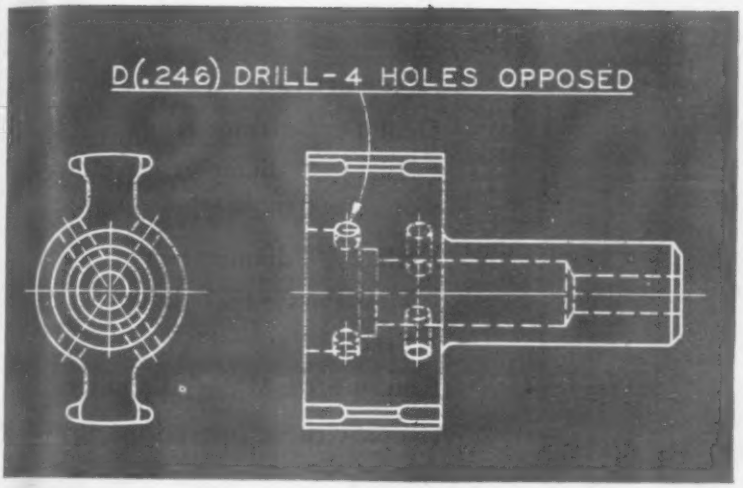
Write today for specifications and prices

AMMCO 2100 COMMONWEALTH AVENUE NORTH CHICAGO, ILLINOIS

There are 2 ways to do this job —

1. The EXPENSIVE WAY . . . or

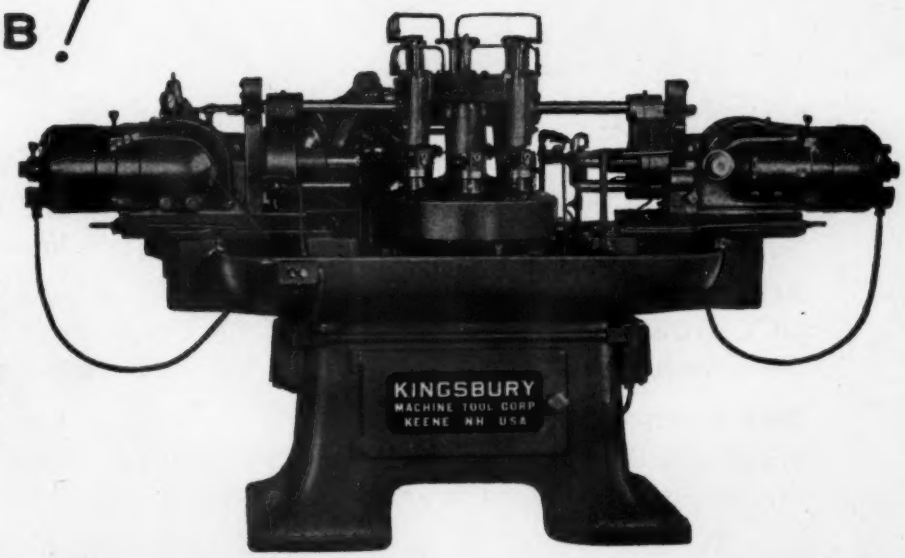
2. The FLEXIMATIC *by KINGSBURY*



WAY

The expensive way to drill the four opposed holes in this shock absorber part would be to use a general-purpose drilling machine. Production would be limited to one hole at a time and by operator skill in manual indexing, etc. The FLEXIMATIC way uses standard Units set up on a standard base around an automatically indexing turret. The only manual operations are loading and unloading, and even as these are being performed the Units are drilling work already loaded.

FLEXIMATICS combine the speed and efficiency of a special purpose machine with the valuable advantages obtained by the flexible set-up.



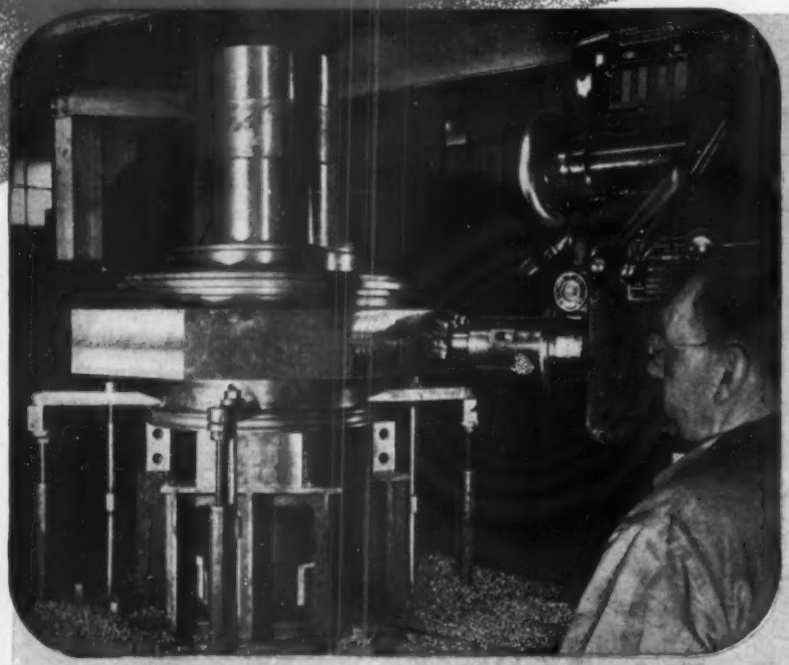
Standard Kingsbury Units for drilling, reaming, boring, spot facing and many milling operations may be mounted in any combination on standard bases and readily changed over to manufacture a wide variety of parts.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

HOW TO MAKE USE OF THE "BUILT-IN" ACCURACY OF YOUR G. & L. HORIZONTAL

Accurate Bore-and-Face Relationship Obtained Automatically with a G. & L. Rotary Table



1st SETTING

The trunnion is mounted on the rotary indexing table in a vertical position as shown.

1st Operation

ROUGH MILL THE EIGHT FACES OF THE OCTAGON. The rotary table is indexed 45° between each operation.

2nd Operation

Finish mill the eight faces of the octagon, using the same method as used in the first operation.

3rd Operation

Drill $1\frac{3}{4}''$ diameter.

Drill $\frac{15}{16}''$ diameter for elongated slot. (*See view on opposite page.*)

Drill $2\frac{1}{2}''$ diameter—two passes.

First Pass—$1\frac{5}{8}''$ drill.

Second Pass—$2\frac{3}{8}''$ drill.

Rough bore $3\frac{25}{32}''$ diameter.

(Repeat these operations for each face of the octagon.)

4th Operation

Finish bore 1.750″ diameter.

Finish bore 2.500″ diameter.

Finish bore 3.781″ diameter.

5th Operation

Finish bore and ream 1″ diameter in elongated slot.

End mill to elongate slot.

6th Operation

End mill 15″ radius on top and bottom of corners of octagon section. (*See view on opposite page.*)

G&L

GIDDINGS & LEWIS

138 DOTY STREET

Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

Without effort or trouble, it is possible to hold close tolerances with your G. & L. Horizontal Boring Machine equipped with a built-in rotary table.

On this job, for instance, both the milled surfaces of the octagon and bored holes are held to within ±.001″ of each other. There's no need of checking and re-checking between indexes because the rotary table can be indexed to within ±.0005″ using dial indicator and stops.

Perhaps you are doing jobs that could be done quicker and more accurately by using a G. & L. Rotary Indexing Table on your boring machine. In many cases, where the nature of the work being done lends itself to the use of a rotary table, the purchase of this equipment is equivalent to installing another machine.

Call in one of our engineers to study your work and make recommendations for doing jobs faster and more accurately. There is no obligation.

2nd SETTING

The part is turned 90°, mounted on blocks and clamped to the angle plate.

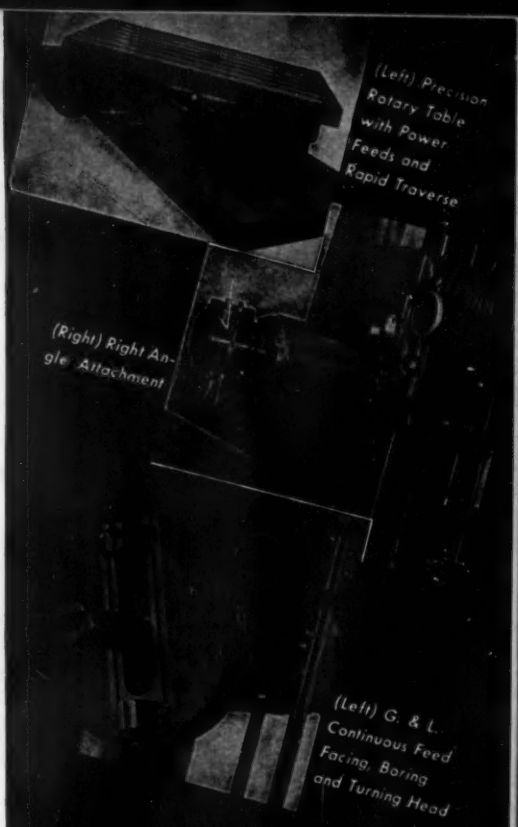
7th Operation

Drill ¾″ diameter.
Ream to .750″.
Move table for operation No. 8.

8th Operation

Drill for ½″–13 tap—hand fed, to permit retraction of the drill to clear chips and tap.

(Repeat these operations for every face of the octagon).



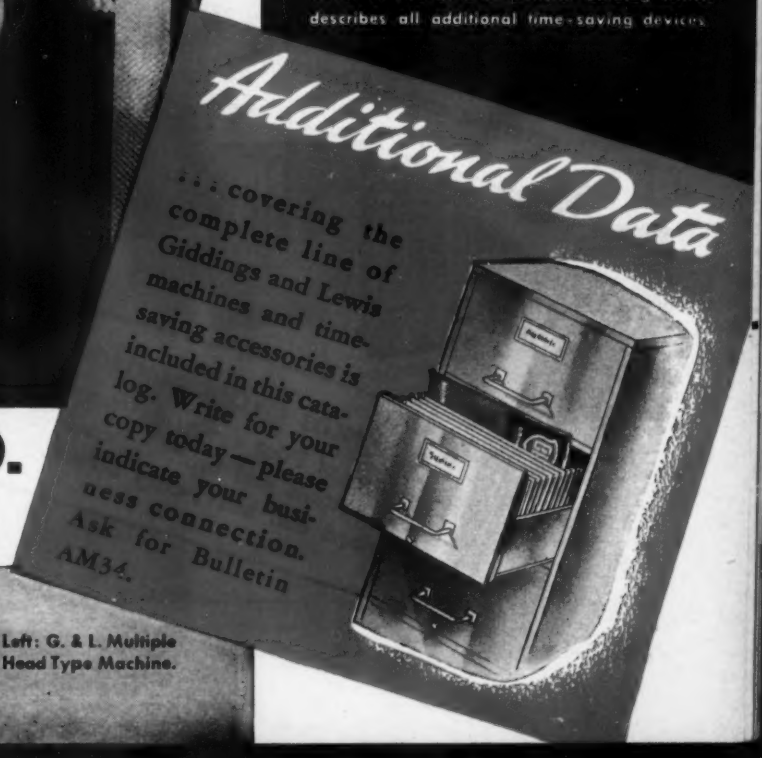
(Left) Precision Rotary Table with Power Feeds and Rapid Traverse

(Right) Right Angle Attachment

(Left) G. & L. Continuous Feed Facing, Boring and Turning Head

Reduce Settings and Save Time with G. & L. Attachments and Accessories . . .

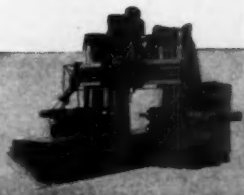
The above are only three of many G. & L. accessories and attachments designed and built to increase machine flexibility and save time. If your work includes an endless variety of parts, you can use some of these attachments profitably. For instance, the Continuous Feed Facing, Boring and Turning Head makes it possible to face and bore simultaneously. Many other operations and combinations of operations not ordinarily performed with the Horizontal Boring, Drilling and Milling Machine, are possible with this attachment. Write for the G. & L. General Catalog which describes all additional time-saving devices.


Additional Data
. . . covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin AM34.

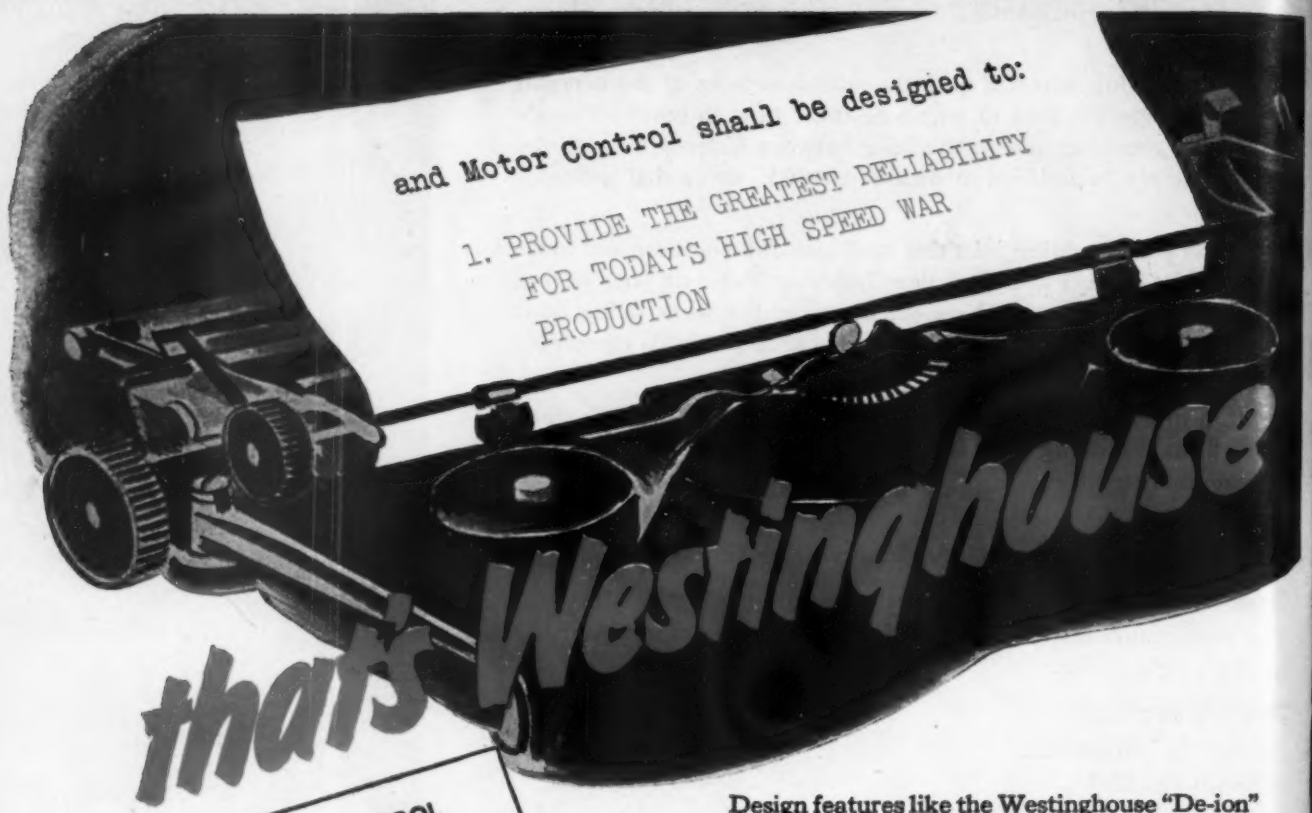
MACHINE TOOL CO.

OND DU LAC, WIS.

Left: G. & L. Planer Type Machine.

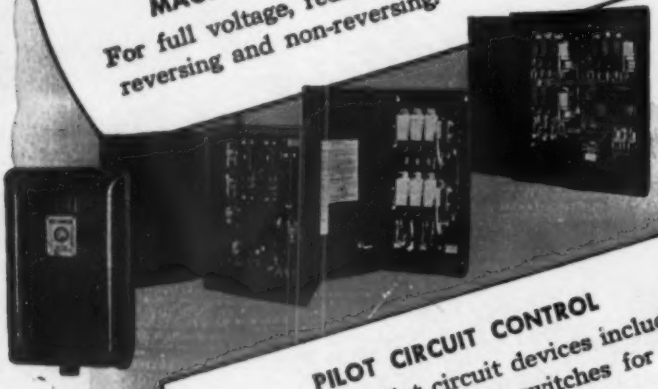


Left: G. & L. Multiple Head Type Machine.


and Motor Control shall be designed to:
1. PROVIDE THE GREATEST RELIABILITY FOR TODAY'S HIGH SPEED WAR PRODUCTION
that's Westinghouse

MANUAL MOTOR CONTROL
For full voltage, reduced voltage, or step starting, speed regulating, reversing and non-reversing.

MAGNETIC MOTOR STARTERS
For full voltage, reduced voltage, step, reversing and non-reversing.



PILOT CIRCUIT CONTROL
All types of Pilot circuit devices including push buttons and limit switches for both standard and heavy-duty service.

Design features like the Westinghouse "De-ion" principle of arc extinction are certainly a common-sense "must". And today's production goals need the kind of protection that the Bi-metal overload relay can give. The Westinghouse line of a-c and d-c motor controls is complete for motor types that meet requirements of a wide variety of applications.

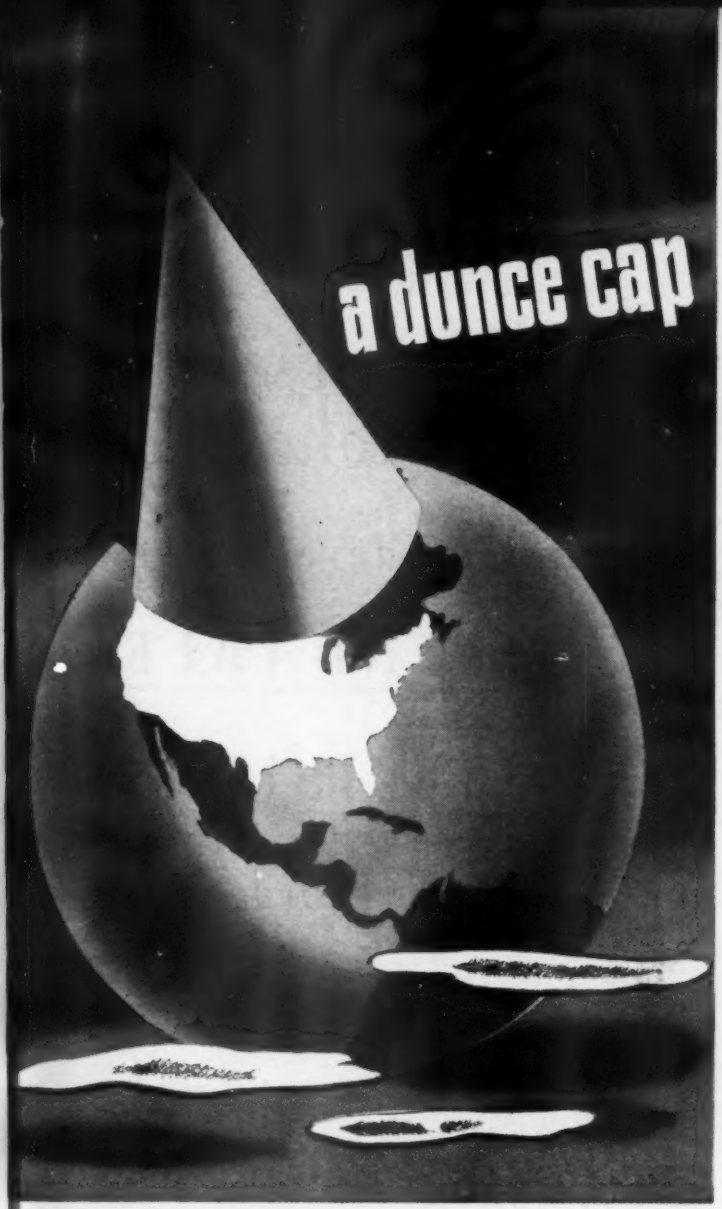
So when you need motor controls—write "Westinghouse" in the specifications. Then get your Westinghouse representative on the phone. He'll help you all the way from application to installation. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21270

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

MOTORS AND CONTROLS



for America?

In the corner of the little one room, red school house there stood a high stool. On it was a cone-shaped head piece. This wasn't often used, but when it was, the class goon wasn't the only one who wore it. Even the smart one, at some time or other, had to wear it for *"not paying attention"*.

"Not paying attention" claimed more dunce cap victims than any other cause.

Today, America suffers the tortures of war for "not having paid attention" to what was going on in the so-called "peaceful interim". While we leaf-raked and loafed, others planned and plotted. This war caught us off in a corner with the dunce cap on. Will the peace?

When present war production at any cost gives way to future product production at lowest cost, it's either *"pay attention"* to world markets, mass sales and low-cost production or again put on the dunce cap.

Returning service men and women will deserve a good turn. So will reconverting American industry. LeBlond will supply the good turn in lathes. They turn a profit as they produce your product. It isn't too soon to plan to retool for "peacework".

THE R.K. **Le BLOND** MACHINE TOOL CO., CINCINNATI, 8

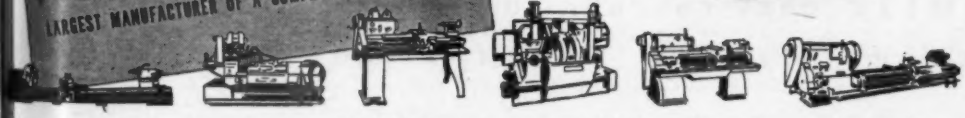
NEW YORK 13, 103 Lafayette St. CAnal 6-5281

CHICAGO 6, 20 N. Wacker Dr. STA 5561

time to retool

Turn to Le Blond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES



HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. Versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

Check·Clip·Mail

FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!

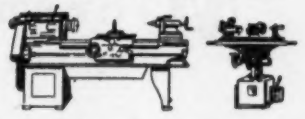


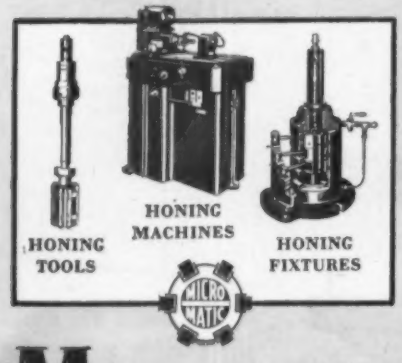
PHOTO COURTESY U. S. SIGNAL CORPS

Yesterday—*Gun ordnance manufacture was not yet an industrial art in Civil War times. Crude, cast gun barrels, lack of recoil mechanisms, and loose tolerance machining limitations made artillery fire a mechanically haphazard accomplishment.*

World War I introduced the dependably accurate precision of the French 75 mm. gun. It could take the roughest kind of field handling. It could always register on a target with only a few rounds, and thereafter remain registered under a high rate of fire.

PHOTO COURTESY "ARMY ORDNANCE"

Today—Tactical requirements of the present War have demanded new types of guns. They must fire heavier caliber shells faster, farther and for a longer time. They must outrange and out-fight all enemy guns. Increased muzzle velocities, better control of the shell trajectory, reduction of fouling of the lands and grooves of the rifling are all major requirements in modern high power, fast firing guns. These accomplishments are made possible by the hone abrading method of metal processing.



Microhoning

Helped develop the DEPENDABLE PRECISION of Modern Ordnance

Tomorrow—When at last peace may come again, the guns of industry must be accurately registered and rapidly demolish the many targets of pent-up demands for industrial goods. Time—and methods—will be of the essence. Microhoning will be ready with new developments offering substantial mechanical advancement and time saving over pre-war methods.

Microhoning is a process of finish machining which generates bore accuracy for roundness and straightness within .0002″ to .0003″—which removes up to 65 cubic inches of stock per hour, has been developed into many ramifications, now being used for war machines. Tomorrow they will be available to speed peacetime production.

Micromatic HONE CORPORATION • Detroit 4, Michigan

MAKERS OF HONING MACHINE TOOLS

Shooting the "BIG DUCKS" MILES AWAY

Shooting enemy planes at a distance of several miles is like shooting big ducks on a grand scale. The gunner must "lead" the target to allow for its movement while the shell is getting there.

Hence, the antiaircraft gun is never sighted at what it is trying to kill—but at some point in advance of the target.

The eye and experience of the most expert duck hunter would be of little use in shooting these "big ducks." The pointing of the gun is a complicated mathematical problem, solved by an elaborate plotting machine. The gun must follow orders of this plotting device with utmost exactness.

Without precision of the very highest order in every critical part, the gun couldn't hit the "big ducks." Antiaircraft fire would be mildly annoying instead of having deadly accuracy.

Microhoning contributes largely to this result because it provides the modern production approach to precision in final stock removal—maximum precision control of surface character.

Without this *production* approach to precision, it would be impossible to build these "big duck" guns in the quantities needed.

Some Microhoned Bores in Antiaircraft and Other Ordnance

Rifle Barrel Lands • Rifle Barrel Grooves • Recuperator Cylinders • Regulator Cylinders • Variable Recoil Cylinders • Rifle Hoops • Tapered Gun Chambers . . . (Guns from 2½ feet to 75 feet long—.30 caliber to 16 inch in diameter).

MICRO MATIC

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

A SOLUTION
TO A VITAL PROBLEM..

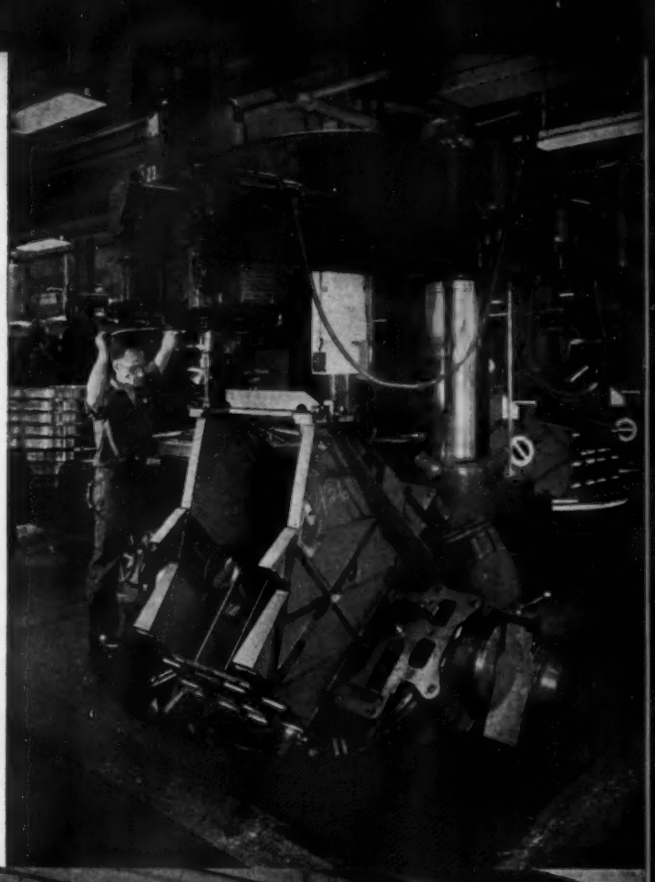
THE AMERICAN TOOL WORKS CO.

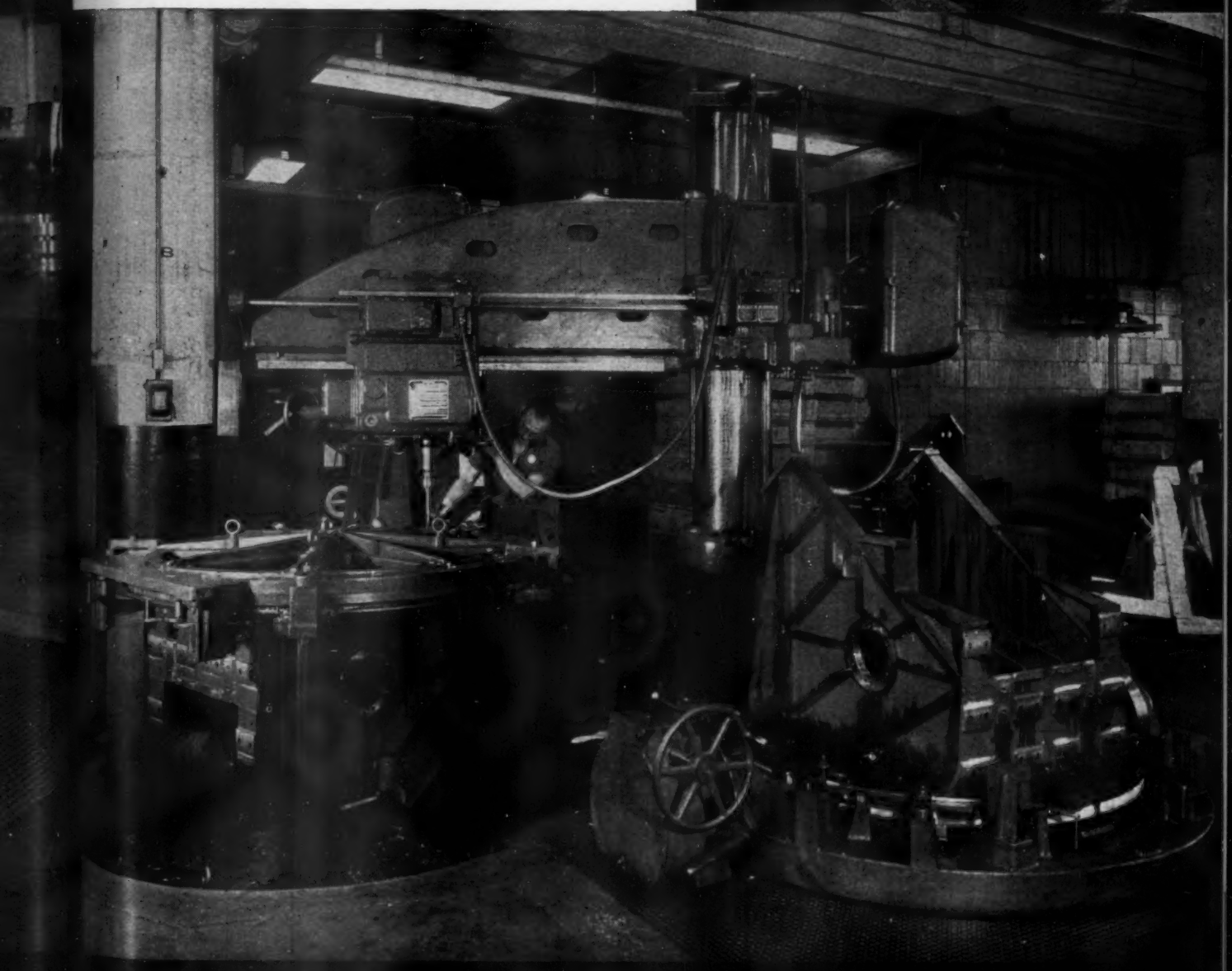
In war industries especially, the man power problem is coming more and more acute. Contractors are avidly searching for a solution—many have found a helpful approach to such a solution by installing labor saving equipment.

The accompanying illustrations show Link Belt Ordnance Company's method of conserving man hours in drilling gun mount frames by using "American" Hole Wizard Radial Drills in combination with tilting work-holding fixtures designed and built by them. By means of this tilting fixture, all the drilling, tapping, and spot facing operations on the holes are accomplished at one work setting, resulting in a tremendous saving of man hours on this one piece alone.

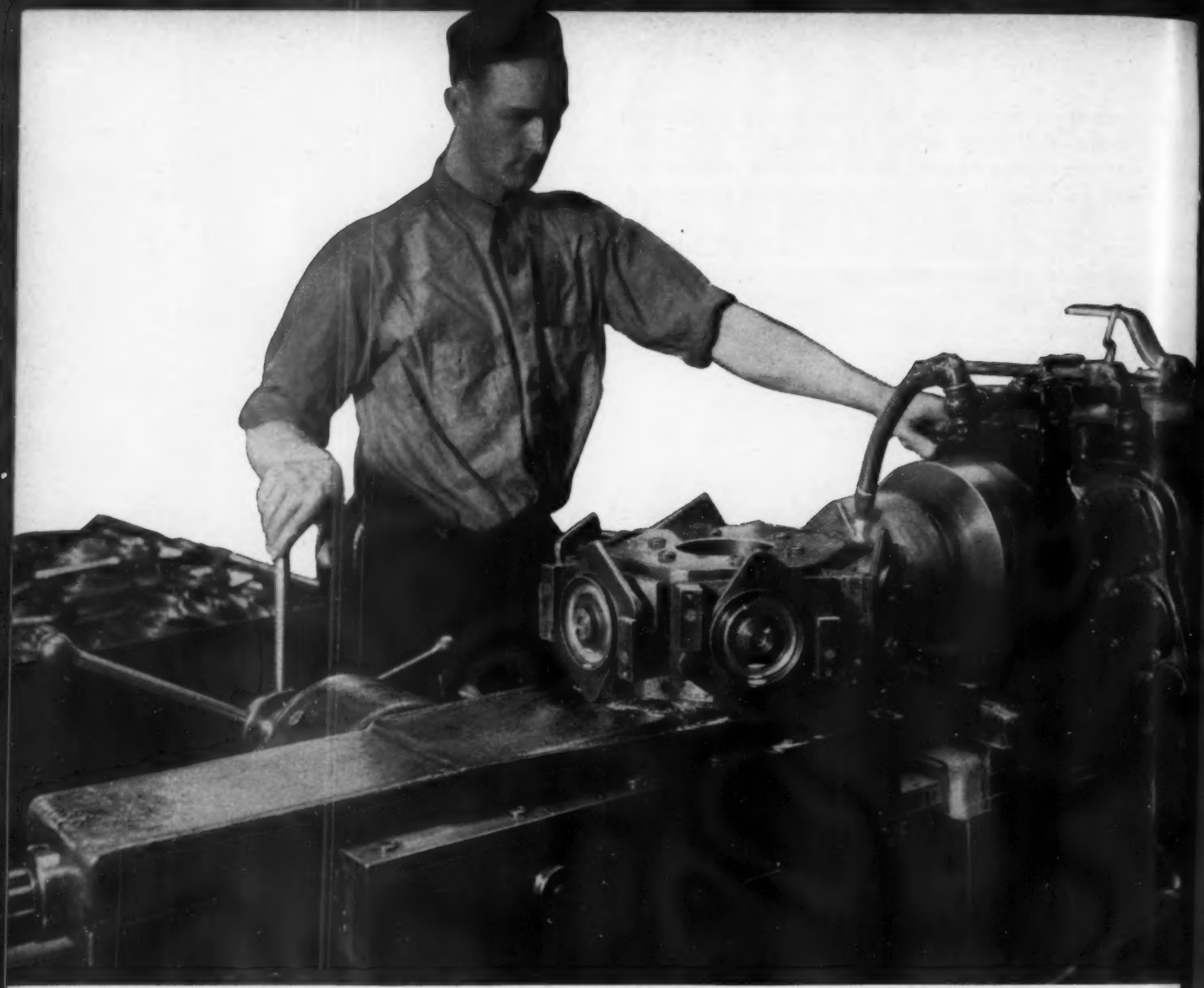
"American" Hole Wizard Radials were selected for this important job because of their convenient, centralized controls and ease of operation and their proven stamina under production pressure.

We welcome the opportunity to discuss such problems with you.





CO. *Lathes and Radial Drills* **Cincinnati, Ohio U.S.A.**



WHAT *Can't* A TURRET LATHE DO?

EVEN the old hands in the machine tool game are often surprised at the versatility of the turret lathe. In many cases, they're taking over work usually done on drill presses, engine lathes, and vertical boring mills, with amazing speed and accuracy.

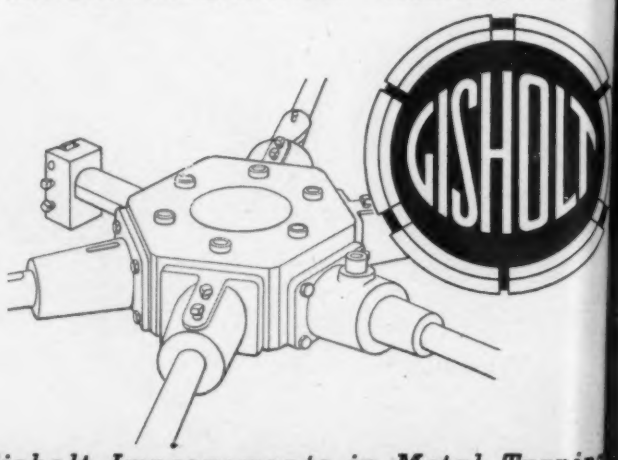
In the photo above, for example, caster top plates are held stationary on six turret faces, while tool head is held in the chuck. Here's continuous operation without stopping the spindle for loading and unloading. Here's average production of 100 pieces per hour.

This ability to handle almost any kind of machining job, with easy step-up and simple operation, makes Gisholt Turret Lathes the most important production tool in thousands of machine shops.

Whatever the turning job, first ask yourself, "Can it be done on a Gisholt Turret Lathe?" The chances are, it can.

GISHOLT MACHINE COMPANY

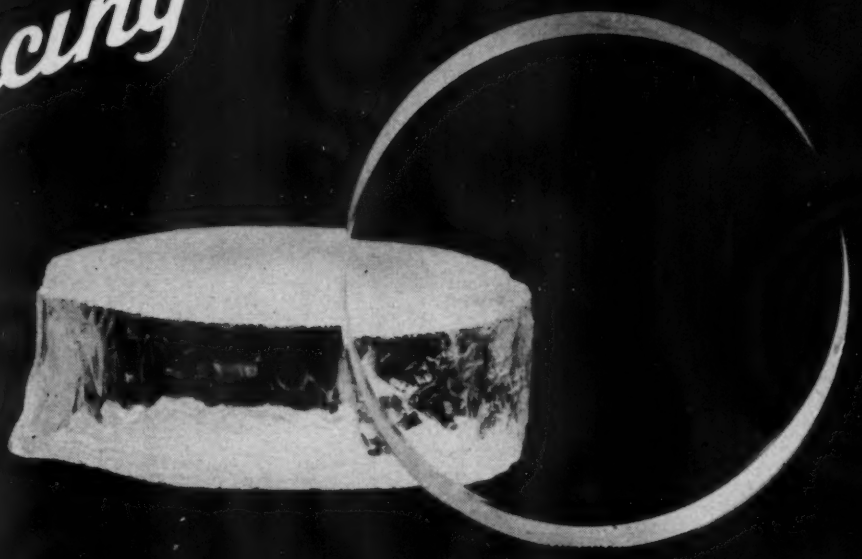
1201 East Washington Avenue • Madison 3, Wisconsin



Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Announcing



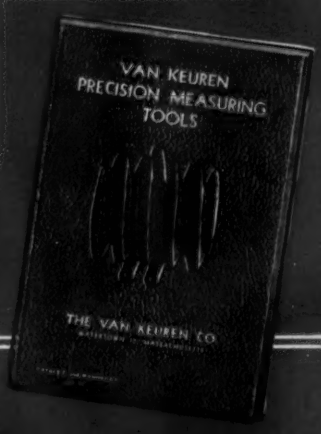
Van Keuren
FUSED QUARTZ OPTICAL FLATS

for checking costly gages . . . and precision lapped parts

In 1920, The Van Keuren Co. pioneered the use of optical flats for measurements with light waves. We now present double surface optical flats made of pure fused quartz.

Temperature changes affect quartz flats very little (1/16 as much as plate glass, 1/6 as much as pyrex). They will wear 10 times as long as ordinary flats. They are the most economical to purchase and the most accurate to use.

Use the new Van Keuren Fused Quartz Optical Flats for measuring the flatness of precision lapped parts, for amplifying gage and instrument maintenance and for the control of wear on gage blocks.



WRITE FOR YOUR COPY OF THE NEW VAN KEUREN CATALOG

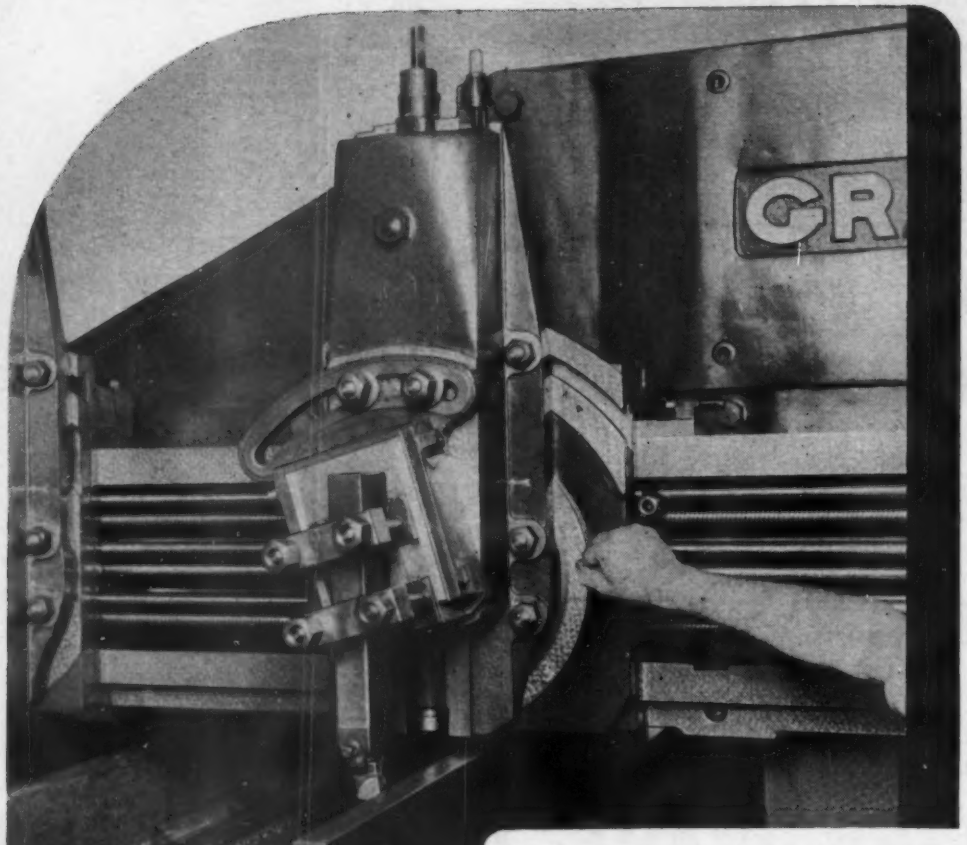
Full information on Van Keuren precision measuring tools is given in our new Catalog and Handbook No. 32, just off the press.

This is a 144 page book, containing complete tables, data and formulae for measuring threads, gears, gages and precision parts.

Van Keuren

25th YEAR

CO., 176 WALTHAM ST., WATERTOWN, MASS.



Tool Rigidity features GRAY Construction

● There are many times in planing operations when tool rigidity is absolutely essential to maintaining required accuracy and finish.

Gray design is such that when long reach tools are used, as illustrated, the slide can be run up on the harp and the rail run down close to the work, thus insuring maximum rigidity.

Another Gray advantage here shown, is "Tool Point Control" of feed and rapid traverse. Either head can be rapid traversed, set with precision by hand or feed engaged in any direction at the head itself, as well as from both ends of the cross rail.

These apparently minor details in the design become major factors in improving the quality and quantity of your planer work.

For full particulars write for Bulletin 40-R-2.

THE G. A. GRAY COMPANY
Cincinnati Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Borin. Machines

METRO *Precision* GAGES

Get your copy of METRO Catalog No. 101 . . . contains complete data on all METRO Precision Tools and Gages.

PROVIDE PRODUCTIONS CHECK ON ACCURACY

- THREAD GAGES IN STOCK
- PLUG AND RING GAGES TO AGD STANDARDS
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METRO TOOL AND GAGE CO.

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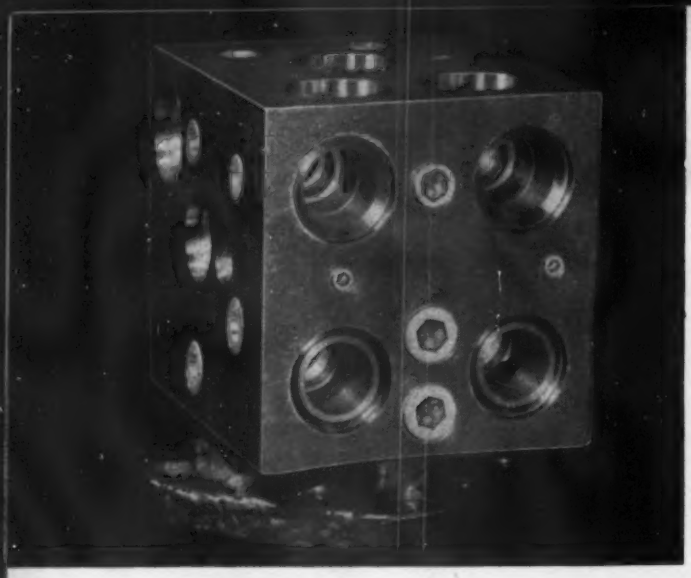
CHICAGO, 30, ILL.



BORING 8 MULTIPLE DIAMETER HOLES

— at one setting — with 30% SAVING IN TIME

• • ANOTHER EXAMPLE OF THE TIME-SAVING, PRECISION PERFORMANCE OF THE AUTOMETRIC MODEL B

(Photos and performance data courtesy of C. B. COTTRELL & SONS CO.) Milwaukee, Wisconsin

Take a good look at the work-piece shown above—a centrifugally-cast steel unit requiring the precision boring of a total of 8 holes — 5 of them with multiple diameters and 3 holes (2 with 1½ inch diameters, 1 with 1¾ inch diameter; 7½ inches long) which must be held to within .0002 on the diameter throughout the entire depth.

Sure, it's a tricky job but a "natural" for the Autometric Model B Precision Jig-Boring Machine. The piece was rough drilled before being brought to the Autometric where it was finish bored to specifications—at one setting—with a 30% saving in time over other methods.

Such fast, precision performance is possible on the Autometric Model B because it is the only jig-borer, with a built-in rotary table, capable of boring holes on all sides of a work-piece *at one setting.*

Many shops consider the Autometric Model B as indispensable equipment for fast, precision boring of a wide variety of parts and pieces.

Autometric Model B Features:

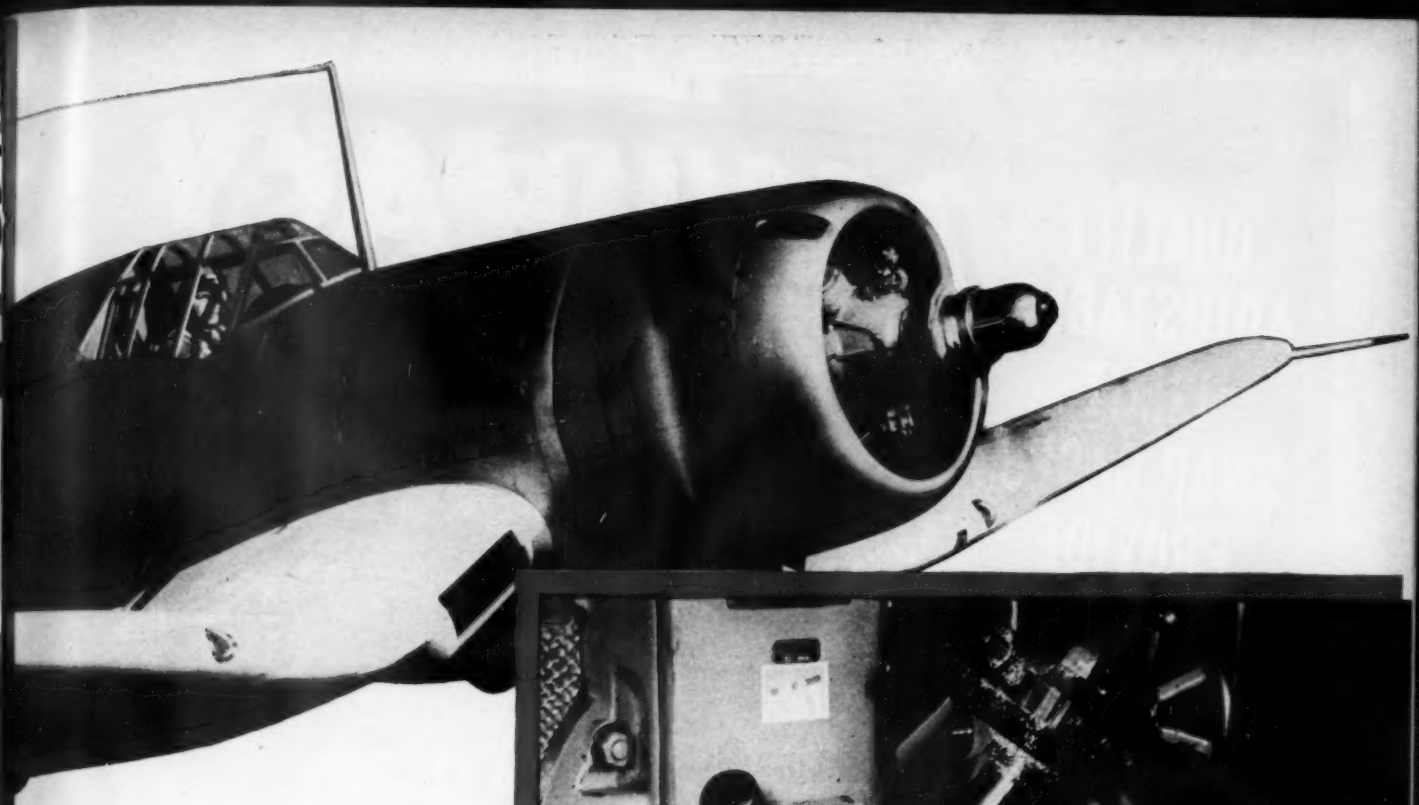
★ Errorless measuring — more rapidly, more accurately — by the Autometric method.
★ Infinite variation of spindle speeds by fingertip control.
★ Infinite selection of feeds by fingertip control.
★ Hardened — ground — super-finished steel ways.

Write for complete information on the Autometric Model B Jig-Boring Machine.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill



Basis For Confidence

American flyers aloft are trusting their lives to the precision workmanship of those who build their planes back home. And to the capacity of those builders to support this skill with the prodigious **number** of planes they need. Two axioms of war which underscore the fact that—

More Bullard Vertical Turret Lathes are in use by America's builders of airplane engines than in any other industry.

• Bullard Vertical Turret Lathes

THE BULLARD COMPANY

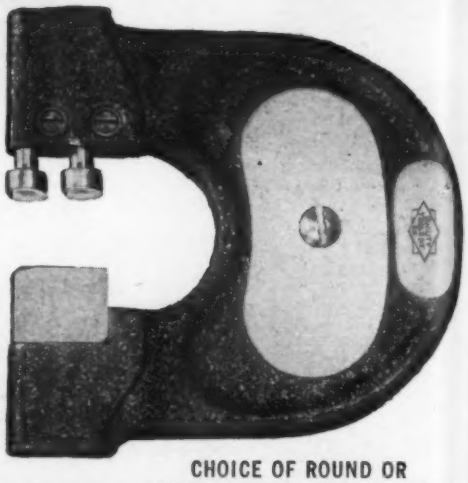
BRIDGEPORT 2, CONNECTICUT

QUALITY ADJUSTABLE LIMIT SNAP GAGES PROVIDE ACCURACY *and* SPEED *in* GAGING

A.G.D. MIDGET Adjustable Limit Snap Gage

Quality A.G.D. Midget Snap Gages are designed for greater ease and speed in gaging small parts. Light in weight (approx. 3 oz.), sensitive and with small contact surfaces (diameter of gaging buttons and width of anvil ¼"), they are superior to heavier type gages for making measurements close to a shoulder or in close quarters.

Available in sizes from .000 to .760



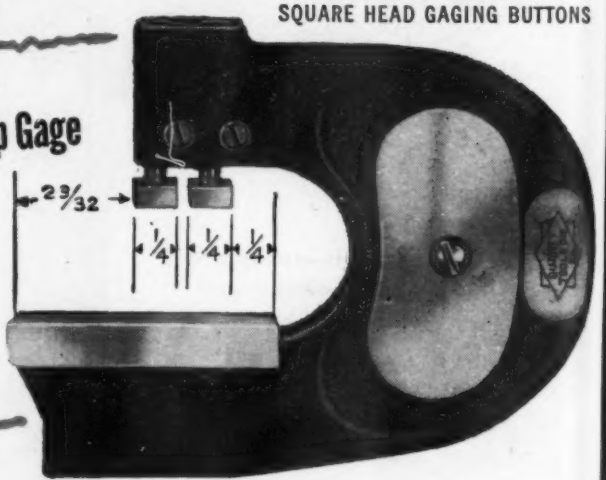
CHOICE OF ROUND OR SQUARE HEAD GAGING BUTTONS

Write for Illustrated Price List

"KWIK-CHEK" MIDGET Adjustable Limit Snap Gage

Odd and irregular shaped work may be easily and accurately checked with a Quality "Kwik-Chek" Midget Gage. Note the extension of the anvil which allows proper lining up of work before presenting it to the gaging buttons. Provides real speed-up of hand checking.

Available in sizes from .000 to .760



QUALITY TOOL & DIE CO.

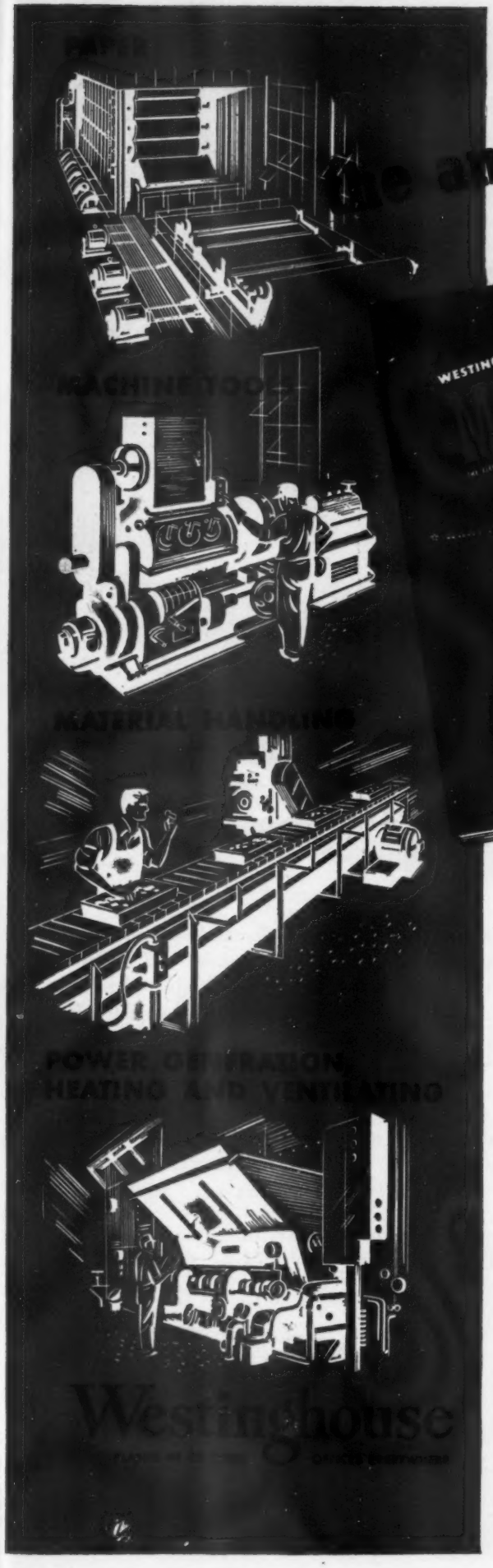
Speed Victory... BUY WAR BONDS

407 N. NOBLE STREET — INDIANAPOLIS 2, INDIANA

ARMY NAVY

EST 1929 QUALITY TOOL & DIE CO.

Manufacturers of "QUALITY" Products



The answer is in this book

ELECTRONIC

MOTOR CONTROL

How to get Stepless d-c Motor Speeds from an a-c Current Supply

Mot-o-Trol, developed by Westinghouse, employs the precision of electronics to provide a new, wide, *stepless* range of speed control for d-c motors from an a-c current source. It starts motors, brings them up to preset speed smoothly and rapidly. It permits wide change of speed at any time, regulates speed under varying loads, applies dynamic braking for timed stopping—and reverses the motor. Many other functions are also possible. There are no separate linestarters—no field rheostats. To get all the facts about this new packaged motor drive, write today for your copy of booklet B-3301. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21306

MOT-O-TROL

Electronics at Work

CADILLAC
Thread Ring
GAGES

•

ALL STANDARD SIZES

National Fine — National Coarse
0-80 to 1½-6

IN response to the insistent demands of our many customers, we have recently increased our Standard Thread Ring Gage production facilities and have built up quite a large stock so that we are now able to offer the same quick delivery on almost all sizes of Standard Thread Ring Gages that we have been giving for the past several months on Standard Thread Plug Gages.

In fact, our stock is now so complete that only in very rare instances are we unable to make shipment on the same day the order is received.

Call or wire your order for either Standard Thread Ring or Plug Gages and they will be shipped to you immediately.

WIRE YOUR ORDER Today!

CADILLAC THREAD GAGES CADILLAC

CADILLAC GAGE COMPANY, Detroit 5

FOR GOOD, FAST RESISTANCE WELDING
. . . Even with NEW Operators

Use electronic sequence and weld timers to automatically time the complete welding sequence.

Automatic Timing Means:

1. Operator is relieved of timing operations
2. Increased production
3. More consistent welds—fewer rejects

Sequence timer (CR-7503-F125-G2) having squeeze-, cool-, weld-, hold-, and off-period timers for pulsation welding. The entire G-E line of sequence and weld timers is for use on either air- or fluid-operated welders

7 G-E FEATURES

• **Electronic**—Consistent timing is provided, the timing intervals being determined by electronic circuits.

Less maintenance required—these timers have few moving parts.

• **Each period independently adjustable**—The setting on one dial will not affect the setting on another.

• **Timing dials graduated in cycles**—Dials are located so operator can see all settings easily.

• **Reliable thyratron tubes control timing**—These tubes are of standard type, and are also conveniently located.

• **Nonbeat* with repeat or nonrepeat feature**—A complete sequence is carried out even when the foot (initiating) switch is momentarily closed. This feature reduces the possibility of the operator opening the timing circuit before the weld is completed.

*The few which do not have nonbeat feature have been designed for specific applications.

• **Dead-front panel provides greater safety**—All live parts are covered by an easily removed shield which can be taken off quickly for routine inspection and maintenance.

• **Correlated Design**—General Electric electronic resistance-welding controls are designed to operate in conjunction with these timers. However, the timers may also be used with other manufacturers' controls. Complete interconnection diagrams to assist in installation and maintenance are furnished with combinations of standard electronic controls.

These timers are designed for wall mounting, and can be located on or near the welding machine.

We have a complete line of these weld and sequence timers that are designed to meet your requirements.

RESISTANCE WELDING CONTROL

SEND COUPON

For our bulletin which will help you select exactly the proper timer for your machine.

BUY WAR BONDS

GENERAL ELECTRIC

General Electric Company, Sec. B645-27
Schenectady 5, N. Y.

Please send a copy of your bulletin, "Electronic Sequence and Weld Timers" (GEA-3318).

Name .....

Company .....

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8960

THESE HEAVY TOOLS PROVIDE GREATER RIGIDITY AND INCREASE THE RANGE OF

CINCINNATI ACME TURRET LATHES

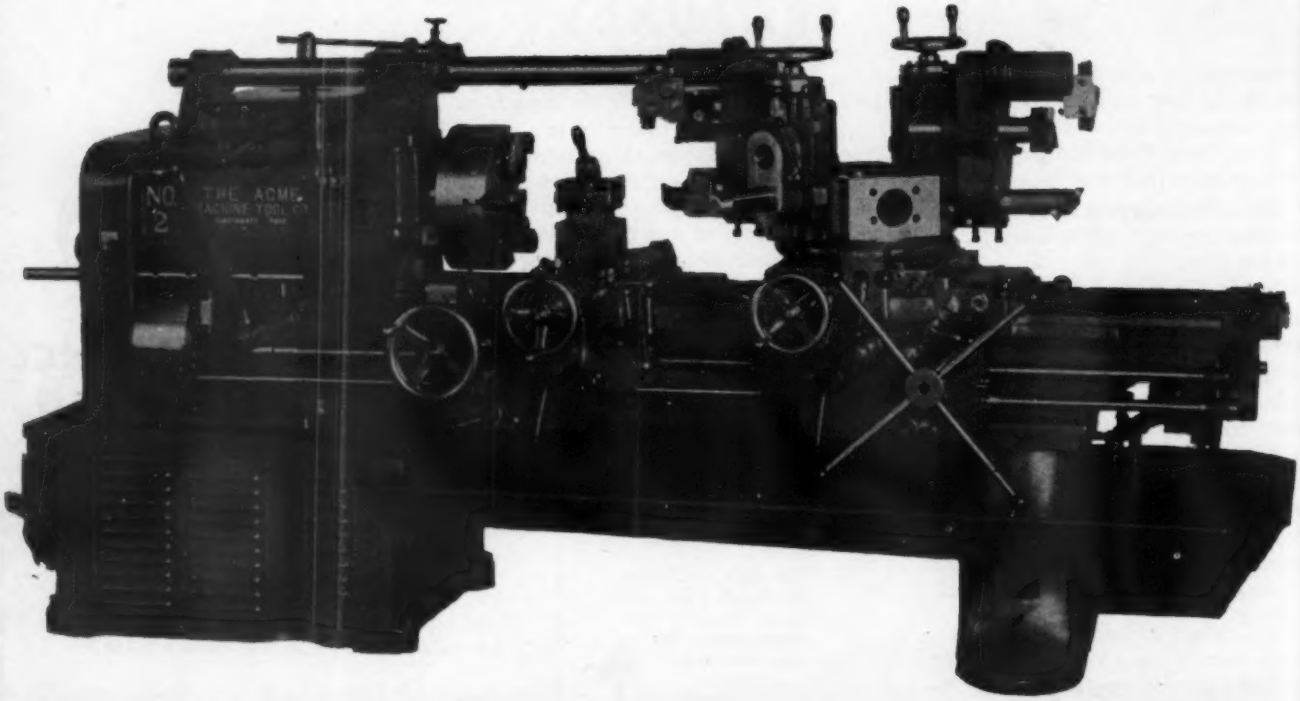
● The group of heavy tool heads and holders illustrated have been developed by Acme Machine Tool Co. to meet the current demands for power—high speed—and accuracy imposed by the increased use of carbide steels. At the left is an adjustable multiple turning head with guide bushing for taking support from the rigid heavy stationary bar mounted on the headstock.

At the extreme right is a standard heavy duty multiple turning head—non adjustable—but with fixed center holes for holding various cutter heads.

Tool holders of straight and angular, types and an adjustable type for the fixed center type head are also included in the center of the group. These are built extremely heavy throughout and accommodate cutting tools of very heavy cross sections.

Acme Turret Lathes are made in bar capacities from 2" to 4½" diameter and in chucking capacities from 20" to 28" swing.

Consult Acme Engineers on your tooling problems.



...The ACME MACHINE TOOL CO.
...CINCINNATI 32, OHIO.

PROMPT SHIPMENT

NOS 20 AND 22

10"x18" 10"x36"

PLAIN GRINDING MACHINES

Electrically Controlled

THESE PRECISION CYLINDRICAL GRINDING MACHINES, playing an important part in today's war production have the construction features and capacities for profitable manufacturing when victory is won and American industry turns to meet the challenge of post-war requirements.

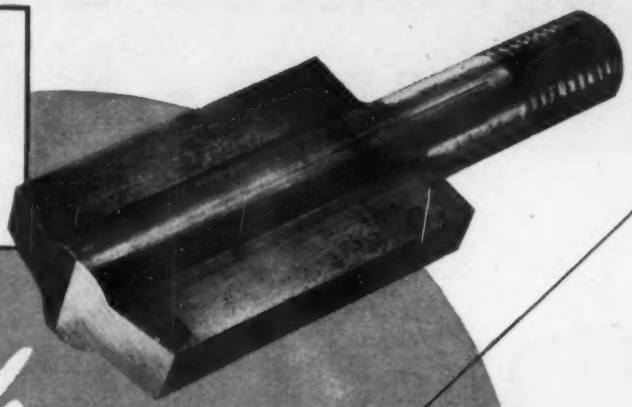
Powerful, sturdy, accurate, dependable — giving high production with minimum maintenance over a long machine life. Furnished as standard for regular table travel and straight-in-feed or plunge-cut grinding, the machines can be ordered with the additional advantages of wheel slide rapid travel and wheel spindle reciprocating arrangement.

We offer the assistance of our experienced engineering staff in applying these machines to your needs.

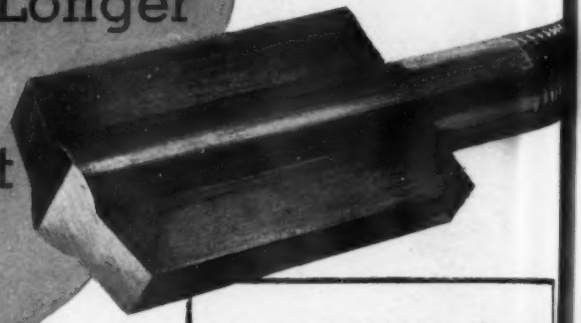
BS BROWN & SHARPE MFG. CO. PROVIDENCE R. I. U. S. A.

BROWN & SHARPE

This tool for punching 3/16" thick O.H. steel sheet was made from a tool steel that promised to provide the *toughness* needed on the job. But excessive wear meant that the punch had to be reground after 190,000 holes had been punched.



Which
OF THESE TWO TOOLS
Will Stay On The Job Longer and Increase Machine Output Per Month?



This punch made from *Stentor* tool steel provided just the right combination of toughness and wear resistance for the job. With it, production jumped over 100% —to 387,000 holes between grinds!

here is WHY one tool does a better job...

Good tool steel is only *one* of the answers to getting tools that stay on the job longer.

But to get best possible results, you need more than that.

A tool giving 100% more production isn't just a stroke of luck! The tool room foreman knew what he needed for the job. He had found a *definite system* for picking the one tool steel that would do the job best. And as the heat treater had complete, easy-to-use instructions, they got real results right off the bat!

You can do the very same thing, by simply following the steps on the opposite page. Carpenter can give you a *definite system* for quickly finding the right tool steel for each job. You'll save time and have fewer tools to make. And when you put Carpenter's heat treating information to work on your jobs, watch the headaches disappear.

To find the road that leads the way to better tools, more output from each machine and press, follow the steps on the opposite page.

THE CARPENTER STEEL COMPANY • 109 W. Bern St., Reading, Pa.

Carpenter MATCHED TOOL STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

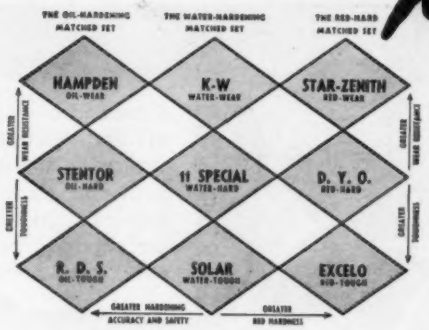
Follow these steps

TO GET LONGER TOOL LIFE!

1 *Get acquainted* with the Matched Set Diagram

It actually points to the tool steel properties you need for almost every type of job in your tool room.

For example, you always start with the center diamond, *No. 11 Special* (water-hard) straight carbon tough timbre tool steel. But when you want greater *wear resistance,* you travel *north* on the diagram. For greater *toughness,* you go *south.* For *red-hardness,* go *east.* And for greater *hardening accuracy* and *safety,* the diagram points to the *west.*

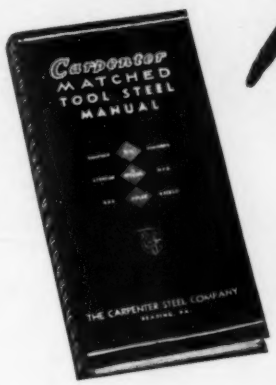


Each of the *Matched Tool Steels* on the diagram picks up its job where another leaves off. So you know in advance just what results to expect.

2 *Ask for a copy of* this Tool Steel Manual

It carries the *Matched Set Diagram* one step further.

In addition to helping you get the most from the diagram, this Manual contains an 80-page *Tool Index and Steel Selector.* Just flick the indexed pages to find the tool steel recommended for any one of more than 200 types of tools! And the *Carpenter Matched Tool Steel Manual* is saving time in heat treating departments, too. It gives complete, simplified heat treating instructions that protect the hours of skilled labor that go into tool making.



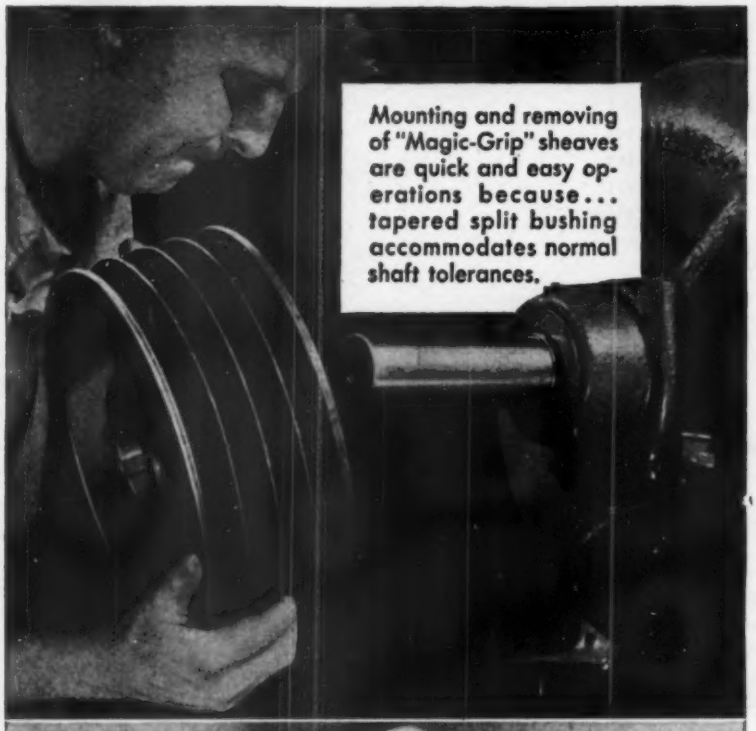
For your free copy of the *Matched Tool Steel Manual,* just drop us a note on your company letterhead.

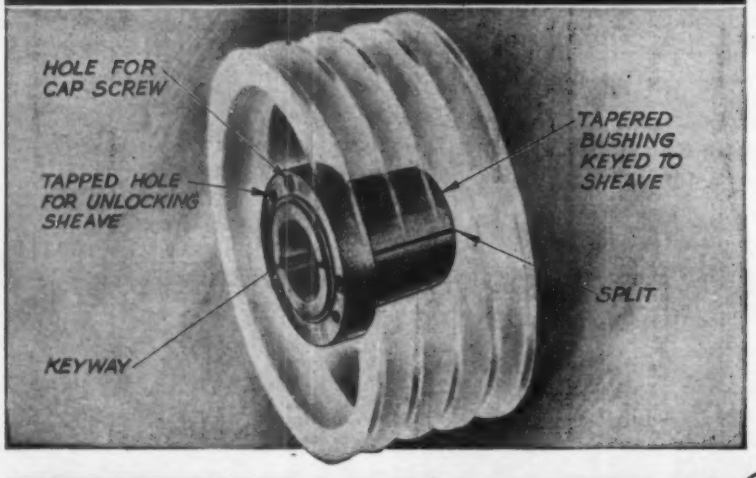
3 *Make use of* this Tool Steel Experience

In your tool room, heat treating department or production shop—here is another way to help get the most from every pound of tool steel you use.

Get in touch with your nearby Carpenter representative and let him put his diversified experience to work for you. He knows tool steel inside and out, and can offer practical suggestions that get problems licked faster. Get in touch with him about that trouble-shooting job of yours, and he will help you get started on the Matched Set Method.

It saves you Man-hours and Money because it "Grips like Magic!"


Mounting and removing of "Magic-Grip" sheaves are quick and easy operations because... tapered split bushing accommodates normal shaft tolerances.



Allis-Chalmers' new "Magic-Grip" Sheave locks to shaft in one easy operation, mounts faster than any other sheave on the market. It helps conserve your motors and machines, too!

THE sheave that "grips like magic" is kind to both shafts and bearings. Its positive clamp fit allows sheave to be changed as often as desired without injury to shaft or itself. And the new design of "Magic-Grip" permits sheave to be mounted closer to motor... increasing bearing life by reducing shaft overhang.

You get smoother running performance, too, because the new "Magic-Grip" sheave is perfectly centered when installed on shaft.

Allis-Chalmers "Magic-Grip" is assembled and mounted as a unit, assuring true alignment. Its split-bushing feature allows for over- or undersized shafts... making it possible for *anyone* to mount or demount sheave easily.

And you get all these advantages at *no increase in price.* Now, more than ever, it pays to make Allis-Chalmers your "V-Belt Drive Headquarters."

"Magic-Grip" sheaves are stocked in a complete line. For full data, ask our district office or dealer for B6310. Or write ALLIS-CHALMERS, MILWAUKEE 1, WIS.

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Allis-Chalmers Texrope

"MAGIC-GRIP" SHEAVES

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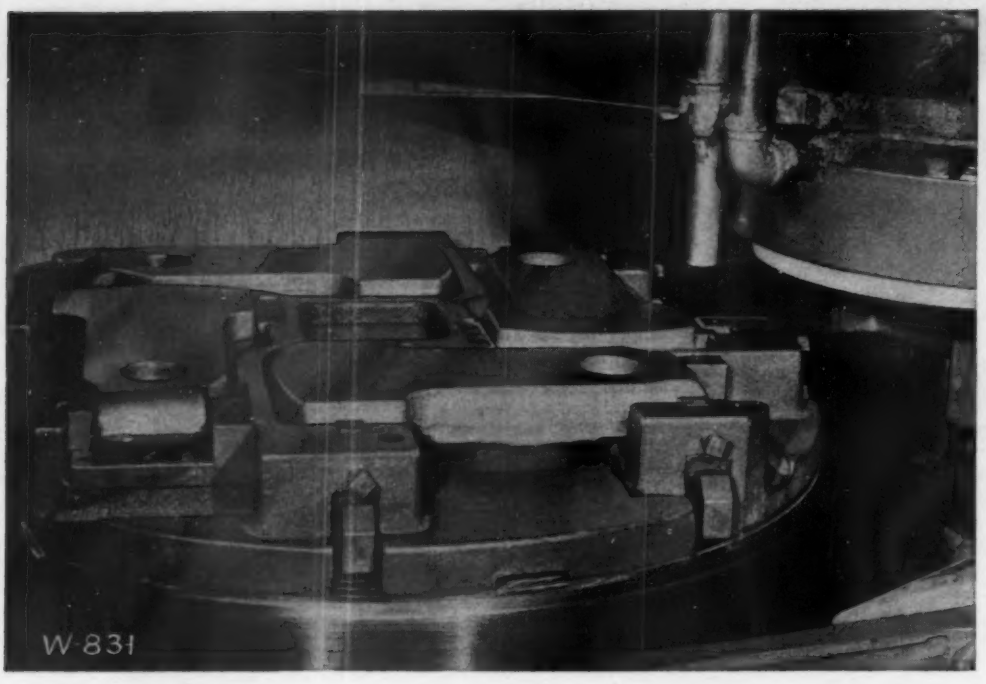

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★*Production*

Adaptability

Fixture Saving

Operation Saving

Material Saving

Fine Finish

★*Flatness*

Close Limits

★*Production* ★*Flatness*

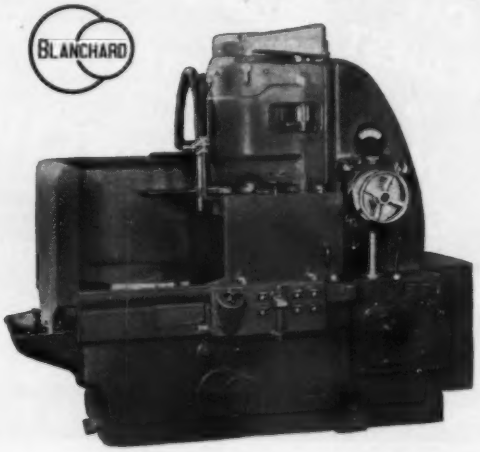
Crankshaft Cheeks ground from the rough

These crankshaft cheeks of tough alloy steel are ground from the rough forging removing .080" stock from the surface at the rate of 12 pieces per hour.

This job is typical of many production jobs in which the Blanchard grinds the first surface on the rough casting or forging, making a dependably flat surface from which all later operations can be located.

"Put it on the Blanchard"

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



This job being done on the No. 18 Blanchard Surface Grinder

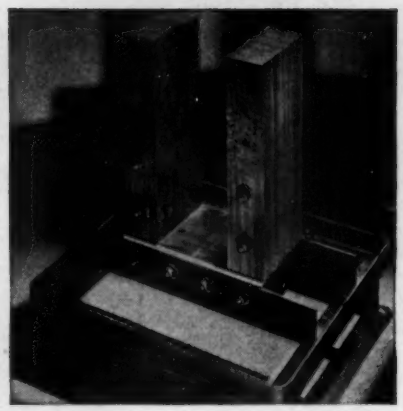
The
BLANCHARD MACHINE COMPANY

64 State St., Cambridge 39, Mass.

GET FINER AND FASTER A. C WELDING WITH AMPAC "400"

1 Revolutionary new patented circuit *increases* efficiency — *cuts* idling loss! Entire construction is *simple, rugged!*

2 Transformer coil uses *rectangular* copper — glass-insulated — with primary over secondary. Air duct between windings dissipates heat — *prevents* breakdown!



3 Sturdy lower core is 1-piece, U-shaped . . . of die-punched silicon steel. Insures quiet operation . . . with *no* power-wasting air gaps!

6 Power regulation is *smooth — quick — simple!* One-inch movement of upper core covers entire welding range — 50 to 500 amps — in *seven turns* of control wheel. Cuts adjustment time to *minimum*. Speeds welding! A 1677

4 Here's typical Ampac quality — a big, tough, *extra heavy* welding terminal. Note *brazed* connections!

5 Hardened brass guide is simple, fool-proof! Channel shape provides *extra* strength.

GET COMPLETE FACTS on this brilliantly engineered a.c. welder from your nearby Ampac dealer or Allis-Chalmers district office. Ask for bulletin B6302. For data on new Ampac "200" welder, ask for bulletin B6241.

ALLIS-CHALMERS

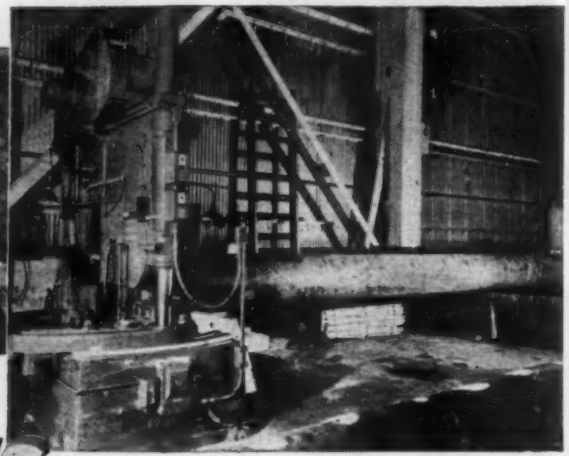
MILWAUKEE, WISCONSIN

The MARVEL of the Year —the new

MARVEL No. 24

Super-Giant Hydraulic Hack Saw

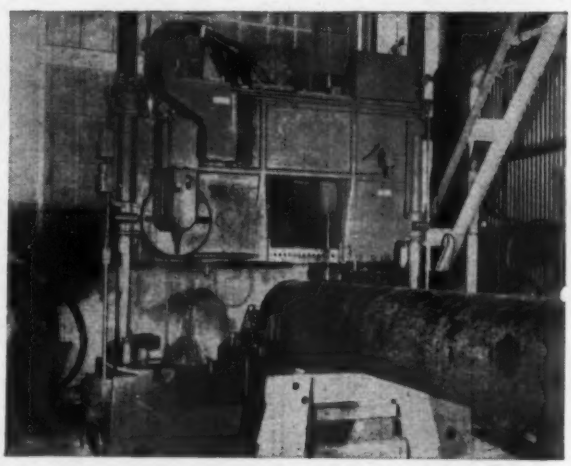
—Capacity 24" x 24"



How big is this machine? Judge from the man in the photo. Its weight, 16,000 pounds—8 tons! Twice the weight of the No. 18 MARVEL heretofore the world's largest hack saw!

The Hack Saw has grown up again! And now you can cut off large billets, forgings, die blocks, etc., up to 24 inch round or square, with the same degree of economy you cut off smaller size work. Yes, the new No. 24 MARVEL is actually a "hack saw," in spite of its mammoth size, since it employs a reciprocating blade. Of course, it uses a much larger hack saw blade than any heretofore available (36" long, 4½" wide, ⅛" thick); but it's still an "inexpensive hack saw blade" compared to the cost of large capacity circular cold saw blades. And, because this hack saw blade is comparatively inexpensive, users of the new giant No. 24 MARVEL machine will not hesitate or worry over cutting off the modern tough alloys in big sizes—a problem that has caused so many headaches where only circular cold saws were available for such large work.

The photos shown were taken at the Mesta Machine Co., Homestead, Pa.—one of the finest-equipped and most modern "heavy" machine shops in the world. The machine is shown cutting off a gigantic 24" round forging. Mesta now has three identical No. 24 MARVEL machines which are doing a fine cutting-off job on all sorts of large size alloys, faster and cheaper, without "fuss," or the nerve-racking howling and groaning of their previous circular saw methods.



This giant saw bears no resemblance to any "small size" hack saw; it follows the modern, basic exclusively "big saw" design of the No. 18 MARVEL.

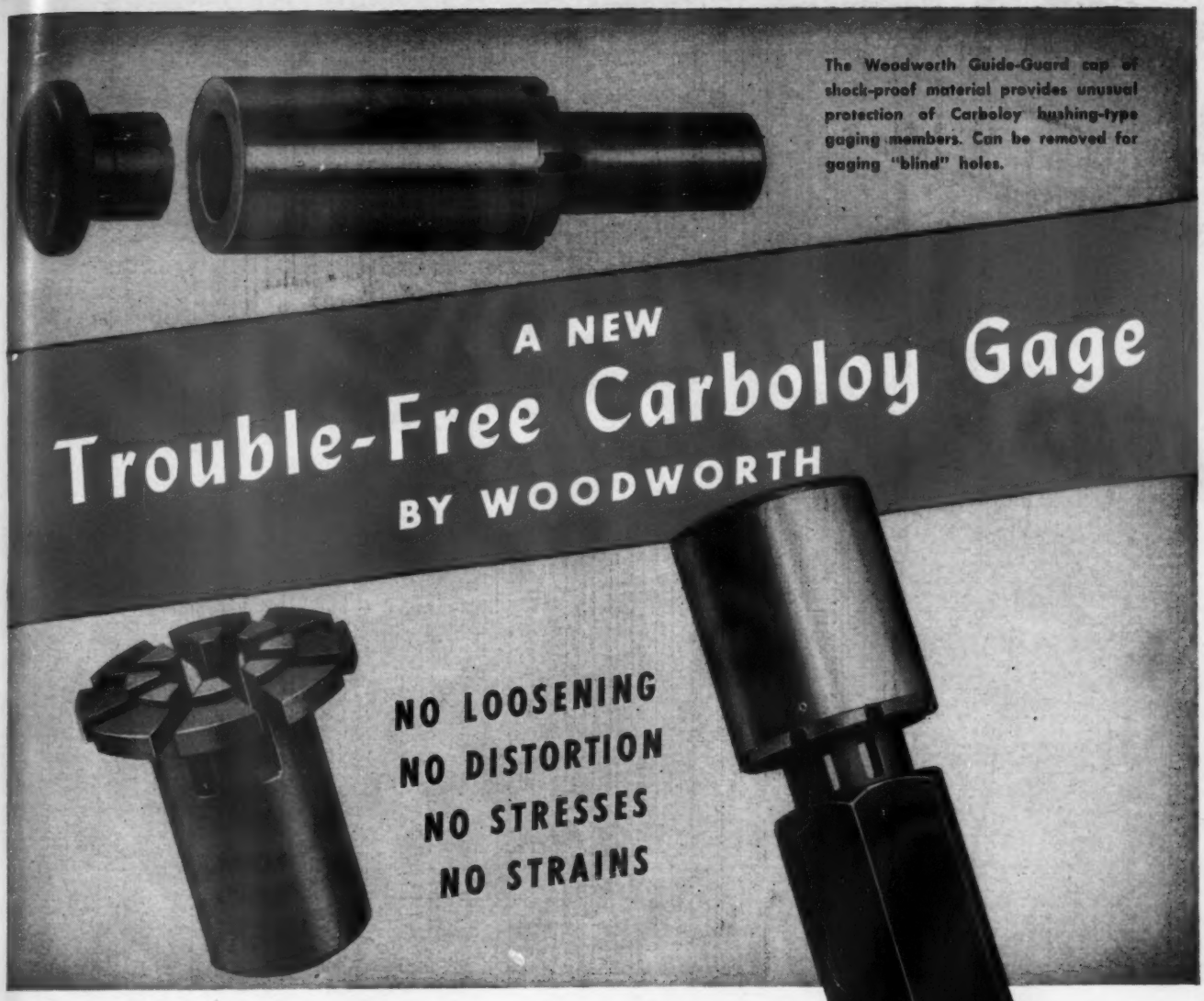
Write for Catalog showing complete line of MARVEL Saws

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

***Eastern Sales Office:* 225 LAFAYETTE ST., NEW YORK 12, N. Y.**


The Woodworth Guide-Guard cap of shock-proof material provides unusual protection of Carboloy bushing-type gaging members. Can be removed for gaging "blind" holes.
A NEW
Trouble-Free Carboloy Gage
BY WOODWORTH
NO LOOSENING
NO DISTORTION
NO STRESSES
NO STRAINS
WOODWORTH
CARBOLOY GAGES

Exclusive Segmented Shank

(Patent applied for)

Woodworth's exclusive segmented shank compensates for differences in coefficient of expansion between cemented carbides and steel . . . thus assuring a trouble-free bond between these two metals.

The segments permit "breathing" . . . and allow for expansion or contraction due to temperature changes, with no distortion to the Carboloy gaging member.

Write for Circular 44-C.

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ZIP-LIFT
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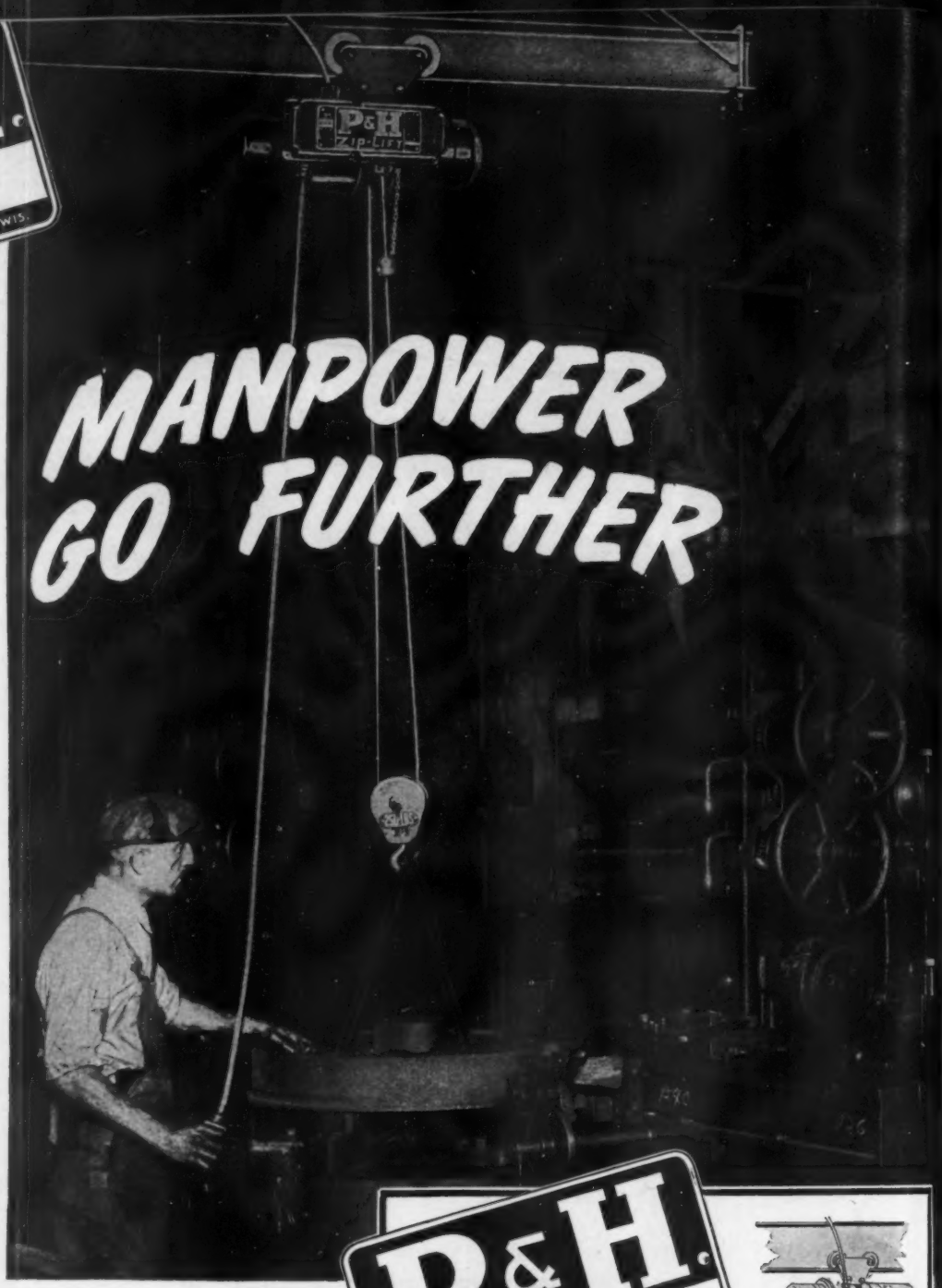
MAKE MANPOWER GO FURTHER



For conserving vital manpower . . . for saving energy . . . for speeding up the handling of materials . . . and for eliminating aisle congestion . . . P&H Zip-Lift Hoists provide the quick, easy answer.

These modern electric hoists can be installed anywhere — quickly. With simple, full magnetic push button you have safe control — lifting, moving and lowering is fast and effortless. Zip-Lifts pay for themselves on an average of twice a year.

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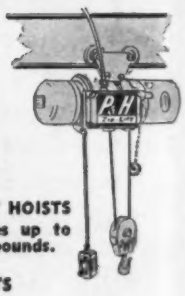
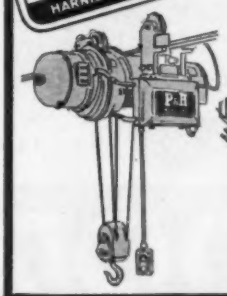
P&H
ELECTRIC HOISTS
HARNISCHFEGER CORP. MILWAUKEE, WIS.



ZIP-LIFT HOISTS
Capacities up to 2,000 pounds.



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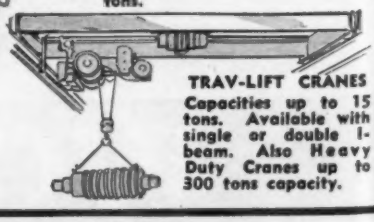

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Is this a "BAD" scratch?

Scratch in alclad coating, magnified 100 times. Observers agree that scratches seldom penetrate to this depth.

" ---- In case of Alclad Aluminum Sheet, this material will not be rejected for scratches that do not extend through to the base metal."

Plane production was accelerated when Government Specification Agencies announced the above decision on what constitutes a "safe" or "unsafe" scratch in alclad aluminum sheet. Contractors were given a usable standard of quality. Though made some time ago, it is repeated here for the benefit of any workers in aluminum who may not be familiar with the ruling.

Data on which this decision was based have since been supplemented by considerable new data. All confirm and strengthen the original findings. Typical results of the newer tests are shown in the table at the right.

Even the deep scratch, penetrating to the base metal, had no effect upon tensile and yield strengths, and only a negligible effect upon the elongation and fatigue strength. It was again concluded, therefore, that scratches which do not penetrate through the alclad coating and into the core are not cause for rejection.

Alclad owes its superior corrosion resistance to two things: First, the coating material used is naturally highly resistant to corrosive attack. Then, where the core is exposed at the ends of the sheet, or is uncovered by wear or scratches, the alclad coating still exercises a galvanic protective effect. Surprisingly enough, this protection extends to rivet heads, extruded stringers, nuts and other similar aluminim parts which are in contact with the alclad coating.

EFFECTS OF SCRATCHES ON TENSILE PROPERTIES*

Average Coating Thickness, In.	Average Depth of Scratch, In.	Average Depth of Scratch, Percent of Coating Thickness	Tensile Strength, Psi.	Yield Strength (Offset Equals 0.2 Percent), Psi.	Elongation in 2 In., Percent
0.0026	0	0	62 105	41 200	20.3
0.0025	0.00150	60	62 810	42 000	19.0
0.0028	0.00288	103	62 730	41 850	16.0

*All stresses computed on basis of full thickness of sheet.

Reprints of the paper, "Effect of Scratches on Fatigue Strength of Alclad Sheet", discussing these findings in detail, are available. For a copy, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

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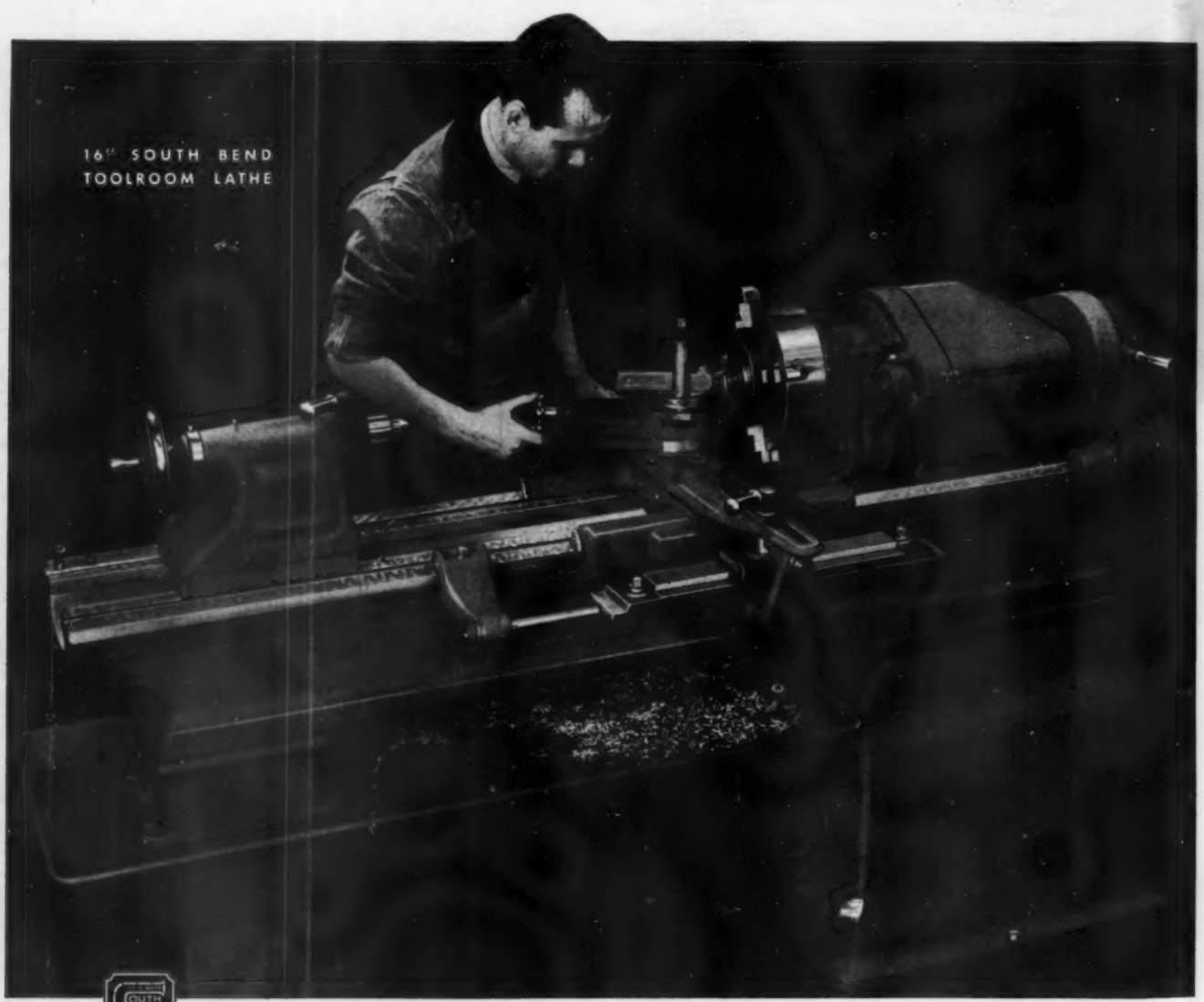
GIVE SKILLED MANPOWER MORE PRODUCING POWER

BUY
WAR
BONDS

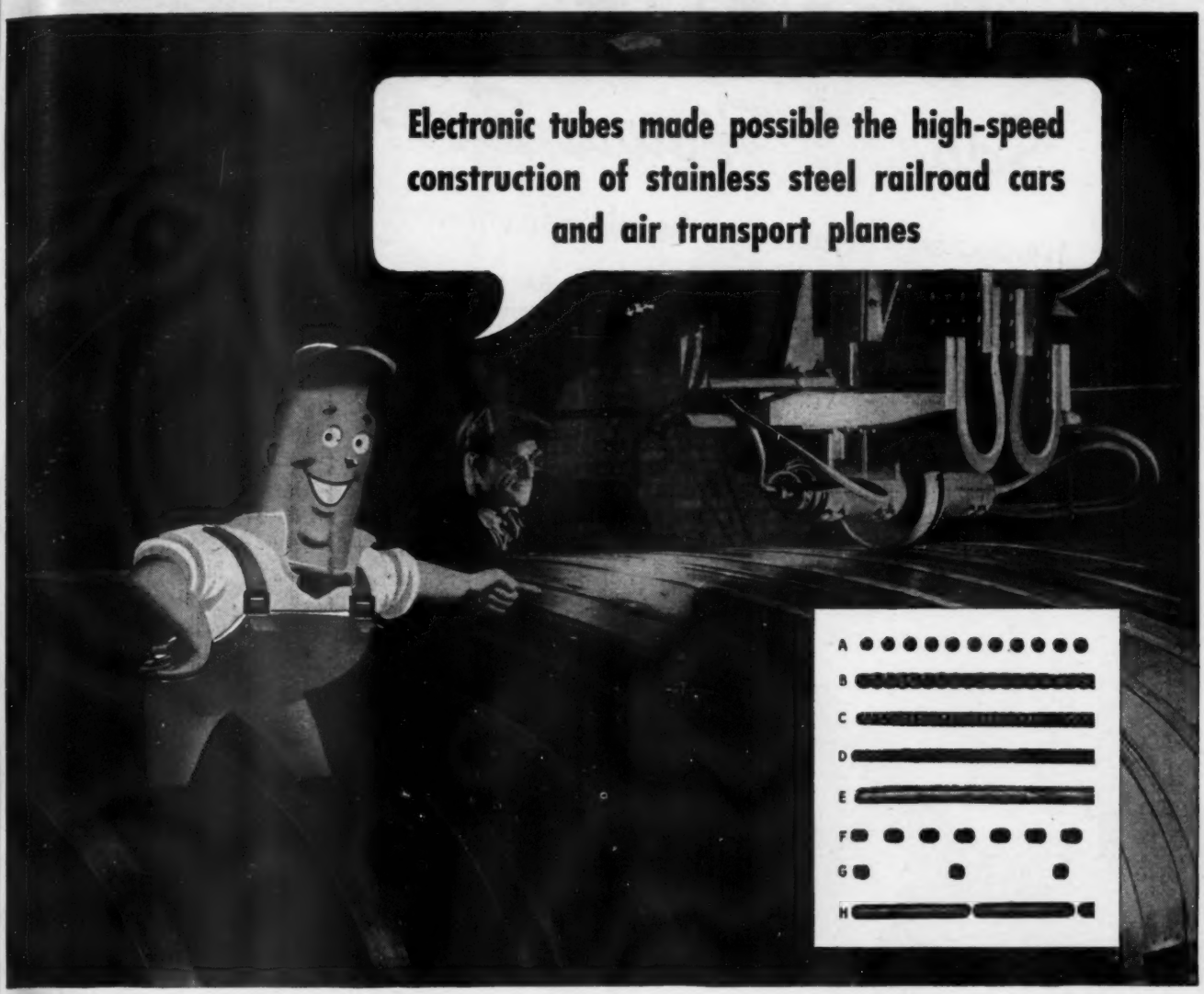
To give our fighting forces the increased striking power of more and better weapons, Industry's skilled manpower must have the increased producing power of fast, accurate tools.

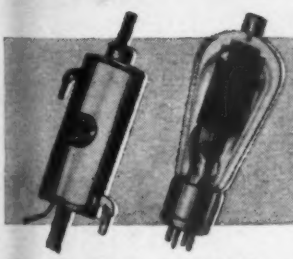
South Bend Lathes squarely meet this requirement. Their rigidity and wide range of spindle speeds permit taking full advantage of the higher cutting speeds that are possible with carbide and diamond tipped tools. Their precision makes it possible to finish turn and bore with such accuracy that subsequent grinding and honing operations can often be eliminated.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes—9″ to 16″ swings. The Turret Lathes are made in two sizes—Series 900 and Series 1000. Write for a catalog.



SOUTH BEND LATHE WORKS
SOUTH BEND 22, INDIANA • LATHE BUILDERS FOR 37 YEARS





The G-E ignitron controls the power.

The G-E thyratron does the timing.

UNDER electronic control, as developed by General Electric electronic engineers, resistance welding has become a high-speed, precision operation that is making yesterday's impossible jobs a routine part of today's production.

With G-E ignitrons controlling the heavy surges of power required, and G-E thyratrons switching them on and off at lightning speed, seam welds can be spotted at any desired distances apart or brought together in an overlapping or solid line. Operations may be performed at any desired speed up to 1800 or more welds per minute — with exactly the right amount of heat applied at exactly the right spot.

Practically all metals can be electronically spot-welded together, or to other metals — in thicknesses ranging from tissue-thin nickel-copper alloy, 40 millionths of an inch thick, to laps of half-inch steel.

Main illustration shows stainless steel sheets being welded to railroad-car framework. Welder is double-wheel electrode type. Inset illustration shows typical seam welds made at approximately 7 feet a minute: (A to E) from 1⅔ to 21 spots to the inch; (F) essentially equal on-and-off periods; (G) long-off-short-on period; (H) short-off-long-on period.

There is a G-E electronic tube for every industrial purpose. Through its nation-wide distributing system, General Electric is prepared to supply users of electronic devices with replacement tubes.

"HOW ELECTRONIC TUBES WORK"

This booklet will be mailed to you *without charge*. Its 24 pages are interestingly illustrated and written in easily understood language. Shows typical electronic tubes and their applications. Address *Electronics Department, General Electric, Schenectady, New York.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P.M. E.W.T. over NBC.*

G.E. HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

SUNICUT

Saves 2 Hours Set-up Time

Transparency permits "on the job" adjustments . . . tool life up 33%

Minutes saved in machine shops today mean lives saved on the battlefields tomorrow . . . and here's how a large plant saves 120 of those minutes on a certain operation.

Transparency of Sunicut makes it possible. Previously they had to stop the machines during the operation to make various tool adjustments . . . requiring 2 hours set-up time. At the suggestion of a Sun Cutting Oil Engineer they made a change in cutting oil — to Sunicut, the transparent, straight sulphurized cutting oil.

Now two hours are saved. Sunicut permits a clear view of tools and work . . . adjustments are made without stopping machines . . . two hours idle set-up time turned into two hours vital production.

Added savings in tool life are realized . . . with Sunicut tools cut 33% longer. Operators find Sunicut cleaner to work with . . . and an estimated $5000 yearly saving has been effected since Sunicut requires no mixing with an expensive base.

As a result of this record Sunicut has been adopted throughout this plant. Save production time and money in your plant, too. Apply the advantages of Sunicut to your cutting oil problems. A Sun Engineer can give you full information. Write

SUN OIL COMPANY • *Philadelphia 3, Pa.*

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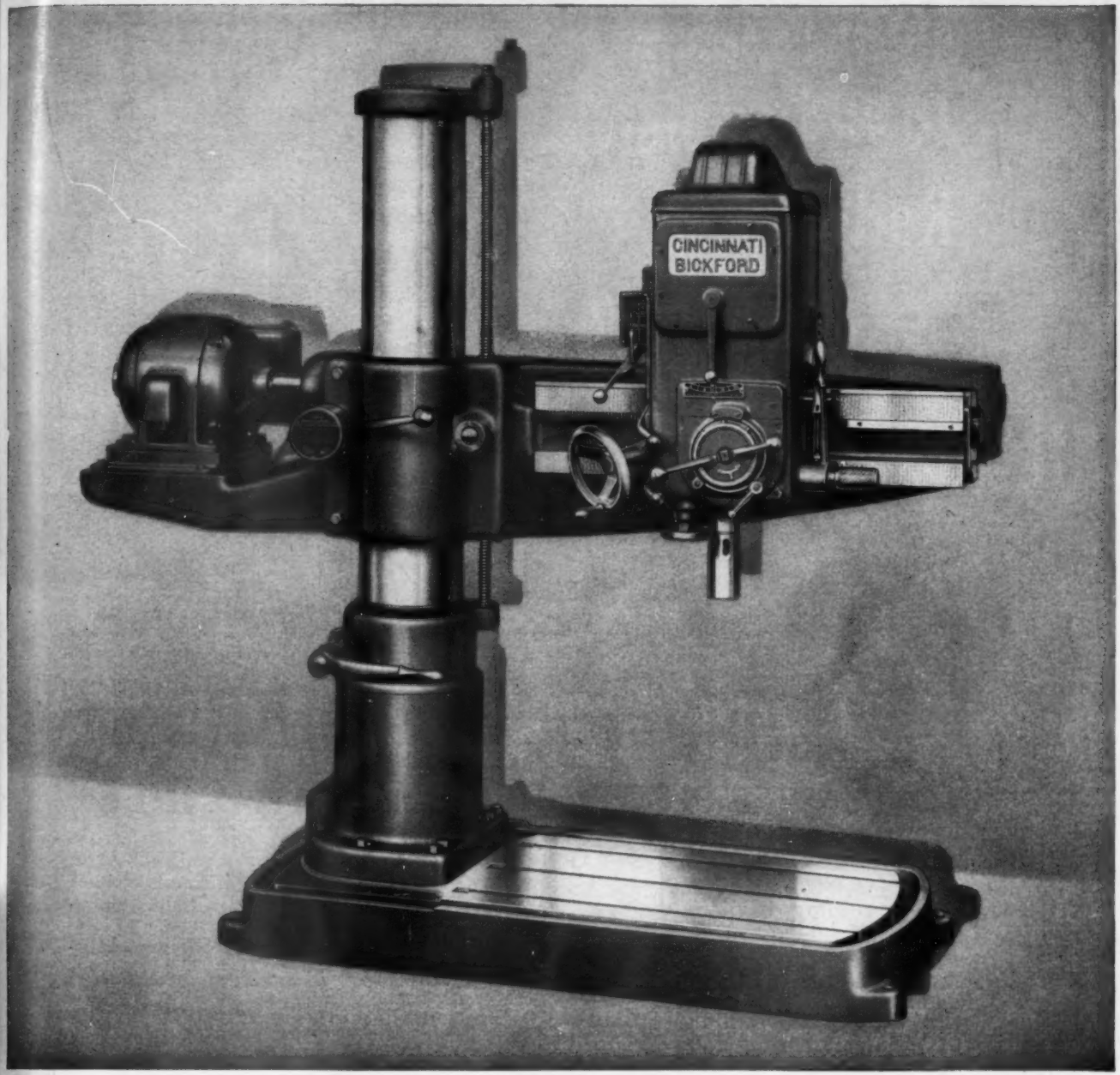


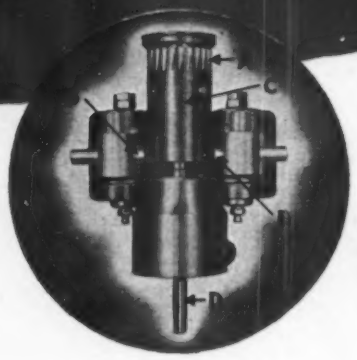
INCREASE *your* PRODUCTION QUICKLY

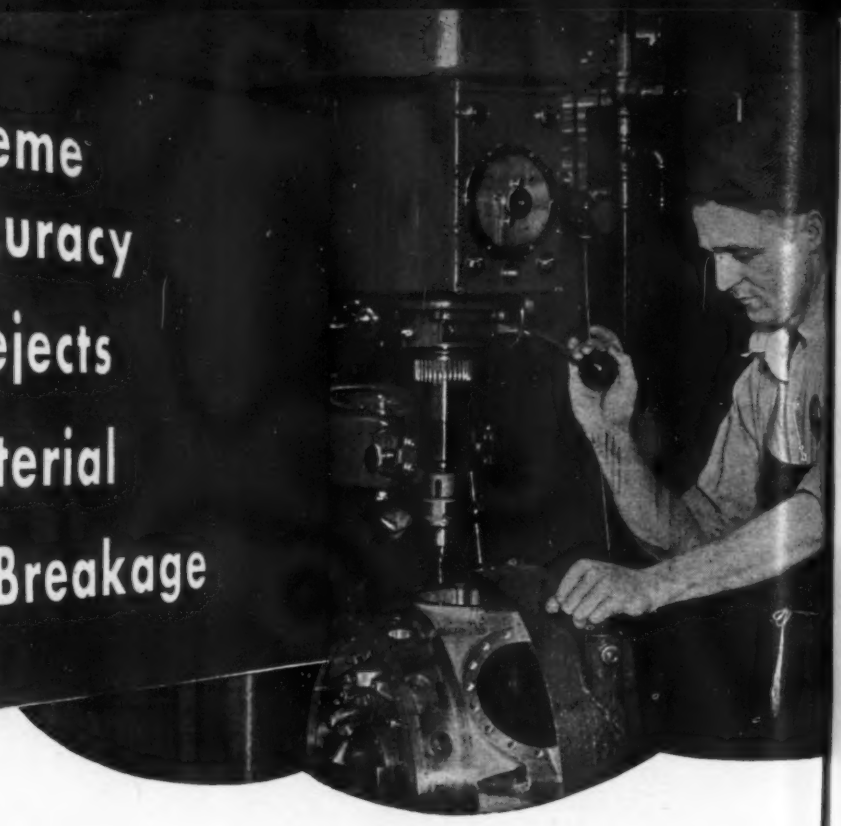
with this 9" dia. column, 3' or 4' arm, High Speed Super Service Radial Drilling Machine. It can be obtained with any one of six different standard speed ranges containing nine spindle speeds . . . the fastest—3500 RPM to 175 RPM . . . the slowest—1200 RPM to 60 RPM. A single lever controls all speed changes. Speed and feed plates read directly. Drill diameters and corresponding spindle speeds are shown. There are four rates of power feed and five different methods of feeding the spindle by power feed, ratchet lever, knurled grip, quick return levers, and spot facing handwheel. The simplicity and ease of opeation of this machine will surely increase your drill department output.

Write today for further information about this or our other radial or upright metal drilling machines

THE CINCINNATI BICKFORD TOOL CO., OAKLEY, CINCINNATI, OHIO

Get Extreme Thread Accuracy Reduce Rejects –Save Material Eliminate Tap Breakage





THE SECRET LIES IN THE NEW LEAD SCREW PRINCIPLE

THREADING or tapping is often the last operation on an accurately machined part. Inaccuracy of thread can mean rejects with the scrapping of critical materials and the loss of all the costly precision operations which have gone before.

The Warner & Swasey Precision Tapping and Threading Machine introduces a new principle to insure extreme accuracy in cutting internal and external threads—a patented combination of lead screw and electrically actuated guide fingers. The upper portion of the lead screw (A) is a hob which cuts mating threads into the brass guide fingers (B) to match the pitch of the lead screw (C) and the tap (D). Solenoid action engages the guide fingers and lead screw to maintain precision lead during the tap travel. This patented mechanism compensates for wear of guide fingers against lead screws and eliminates lead errors and backlash.

On these Warner & Swasey machines, operators —men and women with average training—can cut class 3, 4 and even 5 gage fits in hard and soft materials. Numerous case histories tell of production going up while scrap loss and tap breakage go down.

A catalog describing four models of the Warner & Swasey Precision Tapping and Threading Machines for large and small work capacities from 0-80 to 1½", free on request. Ask your Warner & Swasey representative or write

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

What's in This Issue

Emphasis on Heat-Treating

Heat-treating's important place in tomorrow's production picture is detailed in a searching analysis which starts on page 83. The new developments that may be expected in the field of heat-treating are described, and resultant changes in products are predicted. Articles to follow in subsequent issues will summarize war-spurred progress made in various branches of metal-working.

Bigger Rods Are Quicker

On page 106 A. F. Davis, vice president, Lincoln Electric Co., tells how a step-up in electrode sizes cuts time and costs in fabricating gun mount equipment. Increasing electrodes from 3/32 in., by steps, to 5/32 in. resulted in a 15 percent labor cost and time saving.

Enough, On Time

Material control reaches far, far back from the actual point of assembly and, in the manufacture of Pratt & Whitney engines, Chevrolet sends men into the plant nightly to visually check pieces or raw material to note those on which there is less than a 10-day supply. The methods utilized by Chevrolet to assure enough, on time, are described in an article on page 104.

Short Cuts by Nash

Improvements in manufacturing technique developed at Nash-Kelvinator's Seaman Body plant in connection with the production of radial-type aircraft engines are pictured and explained on pages 98 and 99. Included are short cuts in fields ranging from high-speed machining of aluminum and magnesium parts to improved degreasing techniques and development of safety devices. These, and other, developments permitting greatly increased production rates have been worked out despite lack of familiarity with machine operations.

Global Grinding

Spherical parts of 90-mm. anti-aircraft gun carriages, formerly mated by lapping in a Link-Belt Ordnance Company plant, are now fitted by two grinding operations, with a resultant saving of from 10 to 15 hours production time on each carriage. In an

J. R. MILLER

article commencing on page 100, J. R. Miller, works manager, Link-Belt Ordnance Company, tells how these operations are performed and how they not only cut production time but achieved interchangeability.

Slide Teacher, Slide

A picture is truly worth a thousand words, when the picture is on a slide film and part of a properly prepared course in shop training. Lyne S. Metcalfe, in an article on page 92, writes that "the use of slidefilms to teach fundamental practices in machine tool and other metal-working operations saves as much as 40 percent of the time needed to train production workers." He goes on to describe the type of course organization that has proven successful.

Double Hobbing Ups Output

In producing 0.30 and 0.50 caliber ammunition, one of the limiting factors was the manufacture of bullet jacket dies. Production of these dies has been vastly increased by a double hobbing and lapping process. This eliminates contour drilling and reaming as the hob used is contoured to the shape of the desired jacket. You'll find complete step-by-step explanation of this time-saving method in an article by John Zubell, starting on page 93.

Practical Ideas

This issue's complement of Practical Ideas cover a variety of subjects. E. H. Girardot, General Electric Company, tells of the development of a compound die for sheet-metal punching, Frank Hartley writes of a fixture which indexes round stock for milling squares and F. W. Fromm describes a small-hole gage which has a micrometer thimble. These, and several other helpful ideas, constitute a series beginning on page 107.

Spindle Nose Standards

The development of standards for spindle noses and arbors for milling machines is told and specifications given in the reference book sheets, pages 113 and 115.

COMING

War production's demand for more, and ever more manpower has drawn large quantities of untrained marginal workers into plants, where they have been called upon quickly to learn to do jobs for which long-term training had previously been considered a requisite. With the thought that a person with a natural aptitude for a specific type of work is farther along the road to proficiency than one who lacks it, AC Spark Plug Division, General Motors Corporation, instituted a series of tests for job applicants. The tests and the success with which they have met will be described in a soon-to-be-published article by Orlo L. Crissey, educational director of AC Spark Plug Division.

Wright Aeronautical Corporation has given considerable study to the development of work-handling devices, in order to remove the weight-lifting obstacle to the hiring of women in many jobs formerly limited to men. The devices developed and the success with which they have met will be the subject of an article in an early issue.

The ending of the war will see United States producers reaching out again for world-wide markets. It will see expansion on the basis of knowledge gained and alliances made during the conflict. And it will see the rise of a new era in trade for industrial and commercial interests. Full advantage of these possibilities may be gained only through knowledge of the countries concerned. To aid in this, an article evaluating the development of Brazil's natural resources and industries, present and possible future, will appear in a forthcoming issue.

Designed for Speed–Accuracy–High Production

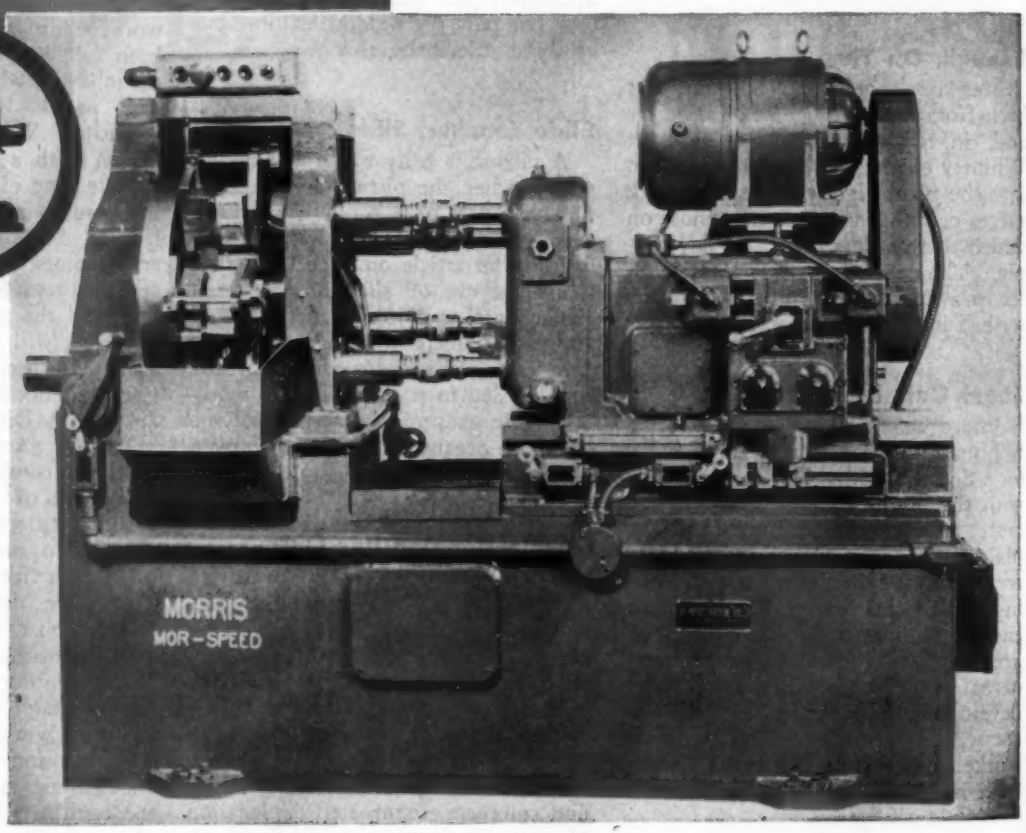
MORRIS MOR-SPEED *Horizontal One Way Machine*

● Here is a specially designed machine with a hydraulically operated feed unit for the four spindle head used to rough and finish bore holes in pump suction body. A bushing plate insures continued accuracy.

The holding fixture is a five station, hand indexed turret arranged with five hand clamp fixtures. Operation is practically continuous as the operator loads and unloads the work in the fifth position while the boring is being done in the other positions.

If you have a production problem which concerns drilling, reaming, boring or similar operations consult the Morris Engineering Staff—their experience and the complete facilities of the Morris organization will help you in developing specialized equipment capable of low cost operation.

Write for complete information or ask one of our engineers to call.



Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI, OHIO

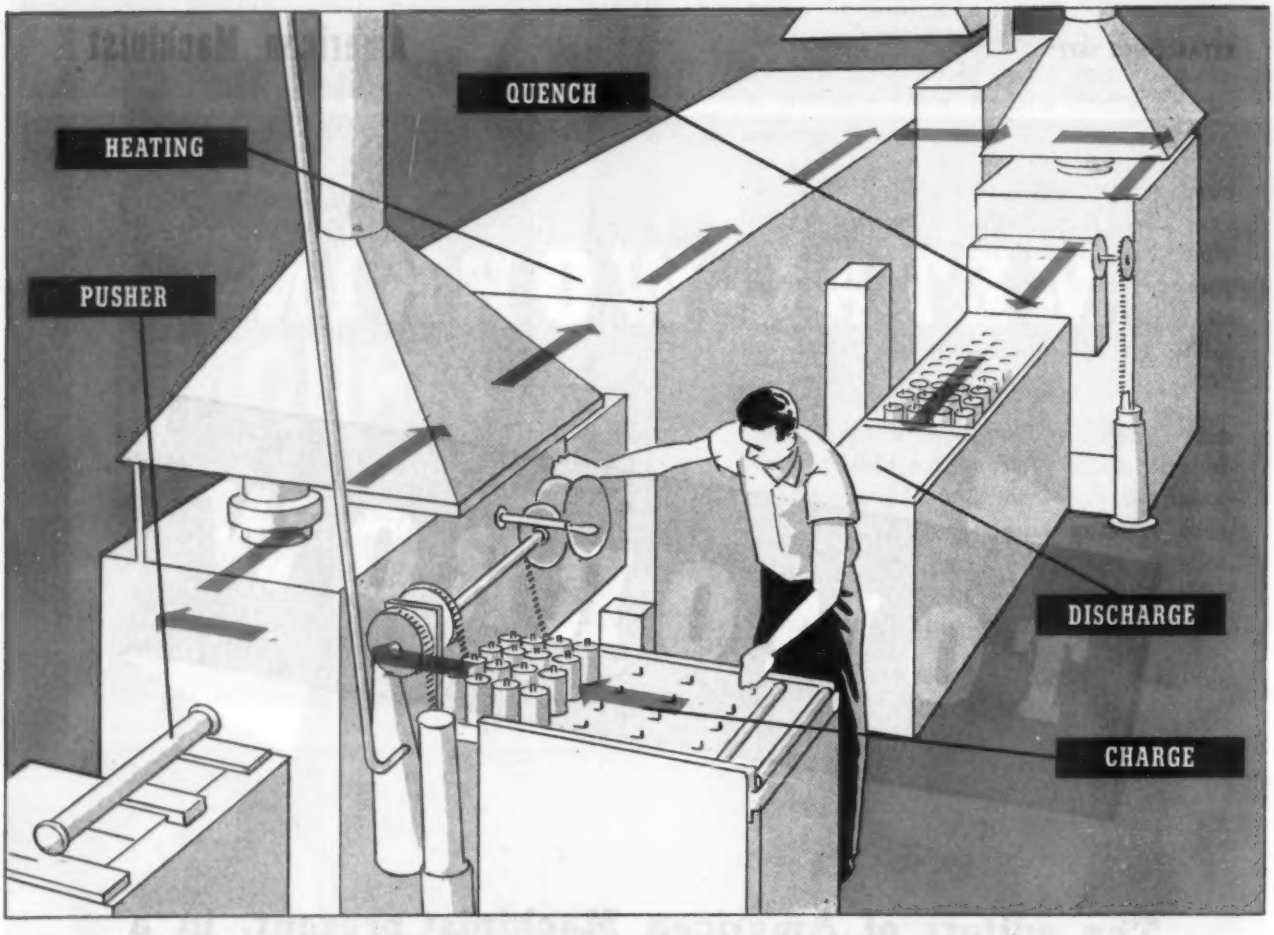
METAL-WORKING TOMORROW

The editors of American Machinist present, in a series of articles, a preview of manufacturing techniques that will soon become common practice

WHAT'S AHEAD IN HEAT-TREATING?

HEAT-TREATING faced a seemingly impossible challenge when presented with the demands of this highly mechanized global war. It has met this challenge admirably and in so doing has made a generation of progress in a period of a few short years. This progress gives a clear picture of some of the things that can be expected in the future and promises results that could scarcely have been imagined five years ago. Here are some of the things we can expect, all made possible by advanced heat-treating techniques; lighter weight and more efficient automobile engines, automobile engines in which all steel parts are made from just one grade of steel, parts that require no finishing operations and parts that are made corrosion resistant while being heat-treated.

Perhaps the most significant change between the past and the future is the shift of the heat-treating department from the dim and musty blacksmith shop to its logical place in the production line. Process changes, the elimination of messy operations and the complete mechanization of heat-treating will make this possible. Noteworthy in the changes made through advanced methods is the



elimination of the pickling tank—and its inherent dirt—from most heat-treating operations. Too, the quench tank has gone under cover to do away with another eyesore.

Of more practical importance is the fact that within the next few years we will see heat-treated parts that need absolutely no finishing operations to clean them or to reach desired surfaces. Parts will be bright and free of surface defects, treated to exactly the right degree of hardness and each part will be exactly the same as its mate. Processes already in use, others just coming into use and still others in the laboratory stages eliminate the bugaboo of heat-treating distortion.

The war has called a halt to the pitched battle between the advocates of furnace heating, molten bath heating, induction heating and flame hardening and has added a new partner—cold treating. In the future these methods will be used side by side and it is conceivable that in many instances two or more of them will be used conjunctively on the same part. Each method, we have learned through the demands of the war emergency, has definite advantages and limitations. With further use and experimentation the scope of each will be even more clearly defined.

Two influences—in close alliance—will determine the heat-treating methods used in the plant of tomorrow. These influences are engineering and economics. It will no longer be a case of fitting available heat-treating methods to the part; rather the part will more often be designed to take advantage of a particular method of treatment. By proper forethought brazing and other joining methods can be combined with heat-treating, done at the same time and give adequate results at vastly lower costs.

Generally, economics will supercede prejudices and personal preferences as the determining factor in choosing heat-treating equipment. All factors will be carefully weighed against the ultimate goals —low cost, high quality, accuracy and speed. Original cost will probably be the least important of influences governing equipment purchases.

Economics and engineering will often combine to show that it would be best and cheapest to install large, expensive custom-built continuous furnace installations. By completely tying together all heat-treating operations with other production sequences it may be found that savings in handling costs will quickly amortize the original cost. Typical of such thought is an installation where a series of press drawing and furnace annealing operations are so

joined that parts go through three separate drawing presses, three annealing ovens and then are discharged as finished products without any handling. As each press completes its work, subsequent parts are moved forward and automatically positioned for the next operation. In other cases it may be shown that a small batch-type furnace will be entirely adequate for the department's needs and hence eliminate costly automatic equipment.

Although slightly removed from the heat-treating department, another trend will have vast influence over the final cost of heat-treated parts. This is the matter of steel. It is generally felt that steels of the future will be much more simple in type and variety. NE steels have shown that many of the complex alloy steels are unnecessary for general use and that low-carbon steel can be made to acquire most of the characteristics now achieved through alloys. The advantages of simplified steels are obvious—less steel inventories will be required, there will be less dependence upon imported alloys, the supply of which might be shut off at any time, and it will be possible to be so well apprised of the characteristics of the steel used that its treatment can be prescribed most accurately.

Steel simplification is such a decided trend that there are already several projects under way which have as a goal the manufacture of an automobile engine in which all steel parts are made of just one grade. The varying requirements of each engine part can be met by selective and judicious application of known heat-treating processes.

Steel simplification will enable steel suppliers to meet the competition of the newer light metals and alloys by permitting them to concentrate on furnishing a better product. Present indications foreshadow a demand for steels that are furnished in the best possible condition. This means that somewhere between the final mill operation and the user's plant most steel will be subjected to a skin-recovery treatment and will be delivered free of scale and surface defects. This will reduce material costs, as stock can be purchased closer to final size and many preliminary grinding and machining operations designed to uncover a satisfactory surface will be unnecessary.

After a brief look at what is to come as the end-result of heat-treating the question naturally arises as to how these marvels will be possible. The answer lies in the more complete and universal application of control over all steps in the heat-treating cycle and over all factors which could possibly affect the final outcome.

At present controls have been extended to atmospheres, furnace temperatures, time and, to a limited extent, to quenching. However, controls are to be so refined and extensively applied that the entire heating process will be fool-proof and require less intensive human supervision. One problem getting concentrated attention is the control of actual temperatures of parts being treated. When this is properly controlled even more exact properties will be imparted to heat-treated parts. Controls will be largely of the recording type so that a complete story of the entire cycle will be available for study and as a guide to repetitive treatment or process changes.

Now for a look at the future as it concerns the individual processes:

Furnace Heating

Despite great advances in competitive heat-treating methods, furnace heating will still carry the greatest load. The type of heating fuel used will be chosen primarily on the basis of available supply and relative costs. Refinements in furnace construction will be made, but changes will be relatively few except in adapting the furnaces to special tasks and to fit production lines.

Typical of the manner in which furnaces can

Despite great advances in competitive heat-treating methods, furnace heating will still carry the greatest load. Great strides will be made in the actual delivery of heat through convection

and will be changed to meet new requirements is the case involving aluminum alloys used in aircraft construction. Most of the common alloys are sensitive to heat-treatment and depend upon such treatment for hardness, tensile strength and resistance to corrosion. Heating these alloys is no great problem, but quenching is of very great concern. If these alloys are permitted to leave the furnace and cool in air, for more than a very few seconds, a reaction occurs which materially reduces dependability and corrosion resistance. Therefore, means had to be provided to get parts into the quench with the least possible time loss. In one instance, a special furnace was built over a quench tank. When heating was completed, the parts were lowered into the quench through hydraulically operated doors in the bottom of the furnace. Here the parts were loaded in basket-type fixtures and the parts are in the quench within two seconds after leaving the heating area. In another type of equipment, special loading racks that properly support the thin sections are provided and quenching is done in spray booths that are placed at the discharge end of the furnace. Some spray booths are permanently affixed to the furnaces and in other cases portable spray booths serve a number of furnaces.

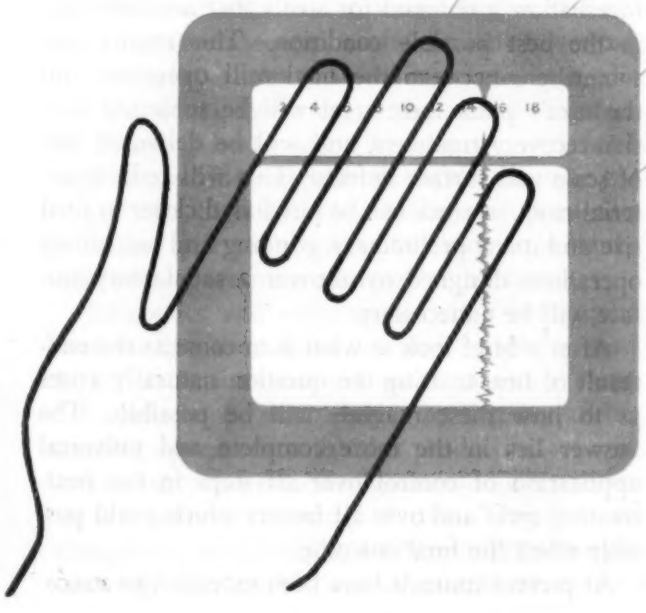
Controlled atmospheres which have been applied so widely to war products will find a ready place in peacetime production, for through them it has been shown that parts can come from the furnace bright and with the proper surface hardness. Their further use will be responsible for the refinements in furnace construction alluded to above. Furnace ovens will be gastight for more economical use of atmospheres. Too, controls will be applied to give more precise selection of temperatures and better control of atmospheres in the heating chamber. Many of these controls will rely upon the hypersensitivity of electronic devices.

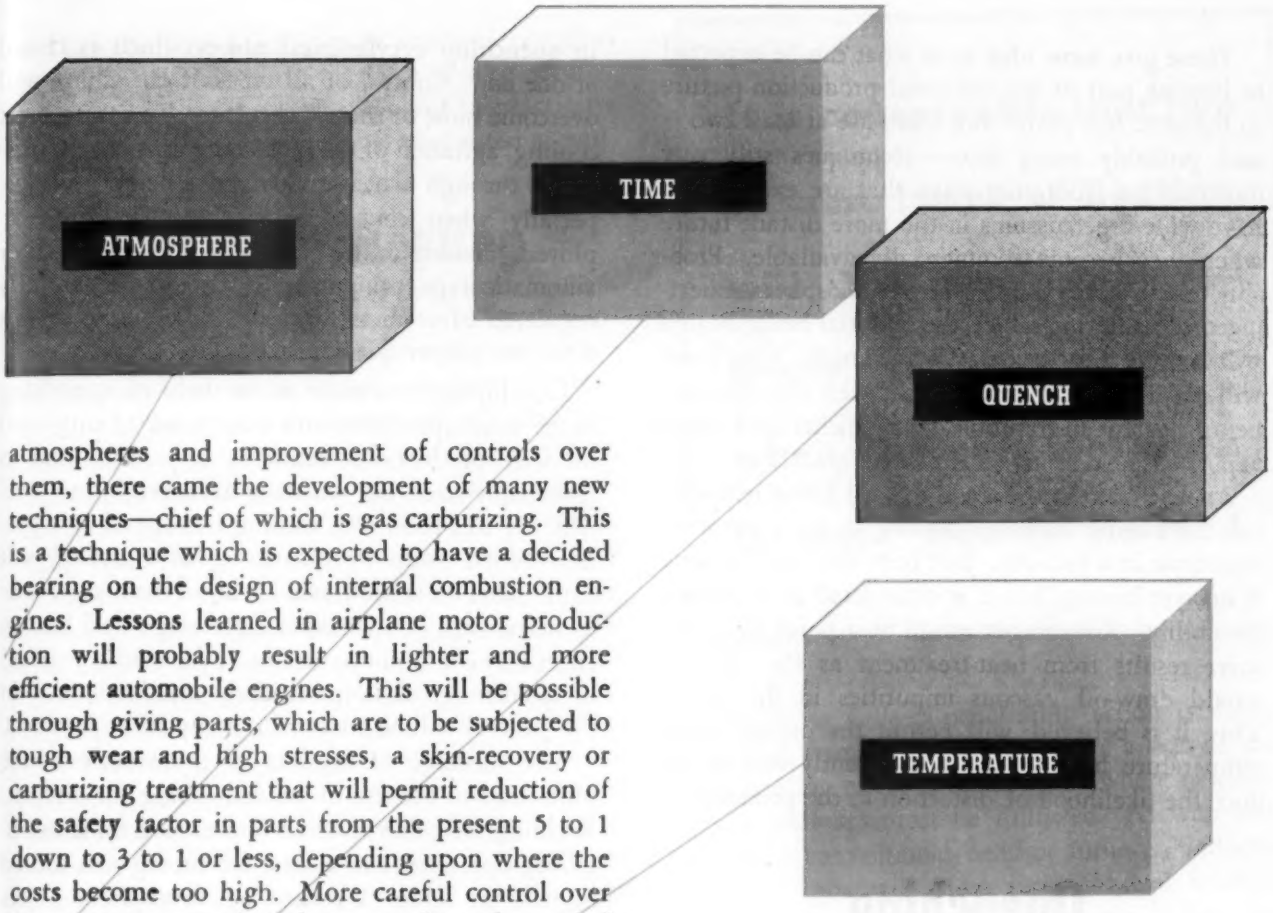
The greatest strides will be made in the actual delivery of heat, no matter how generated, to the parts to be heated. The convection furnace, based on the recirculation of heated air, is now gaining a foothold in low-temperature heating. Within a few years this method of heating will be practical for high temperature heating. It offers these advantages: it is lower in heating costs, it delivers heat to all parts of the charge at the same time, it is faster than direct fired heating and it is much cleaner than all but electric furnaces. Because of these features, convection heating results in a minimum of distortion as heat is applied equally in all directions and it can be used without controlled atmospheres if a slight scale is not objectionable.

Another method of applying heat that will find much favor in the future is radiant tube firing. As with convection heating, heat is carried to all parts of the heating area swiftly thus speeding the entire process. This type of heating is especially applicable to large furnaces. Even in direct-fired gas furnaces fuel economies will result from improved mixtures of gas and air, achieved through refined nozzle construction and better pressure control.

The future will probably see more continuous-type furnaces, but it is not likely that they will be of the multiple-row types. Generally they will be smaller, in line with efforts to decentralize heat-treating, and will fit directly into the production line. The furnace will often be of the pusher-type and will have the quench tank built-in as an integral part. Parts to be treated will be carefully stacked in carrying fixtures that will hold them during their trip through the furnace, through the quench and on to the inspection area. The use of proper fixtures will permit greater loads to be handled and will deliver them in better condition at the end of treatment. Parts will be so arranged as to protect them from distortion, permit their entire surfaces to be exposed to the full force of the heat and prevent damage which might occur from their being dumped loosely into the quench. Zone control of heat will probably be applied so that the parts can be preheated in a portion of the furnace which also contains the high temperature heat area and later slow-cooled, if this be necessary or desirable.

The scope of furnaces has been widened to include many more processes in addition to hardening, drawing and annealing. With the advent of special





atmospheres and improvement of controls over them, there came the development of many new techniques—chief of which is gas carburizing. This is a technique which is expected to have a decided bearing on the design of internal combustion engines. Lessons learned in airplane motor production will probably result in lighter and more efficient automobile engines. This will be possible through giving parts, which are to be subjected to tough wear and high stresses, a skin-recovery or carburizing treatment that will permit reduction of the safety factor in parts from the present 5 to 1 down to 3 to 1 or less, depending upon where the costs become too high. More careful control over temperature, quantity of gas, quality of gas and time will permit precise cases that meet machining tolerances as to depth, intensity and graduation of intensity toward the center of the piece being treated. Gas carburizing can be applied in either continuous- or batch-type furnaces as it can fit into any production plan. This method of carburizing will not entirely supplant pack-carburizing or cyaniding but it will probably be the most generally used and important carburizing process because of its cleanliness and accuracy.

Control has also made possible another surface hardening process—a combination of nitriding and carburizing. This process produces a thin, hard case which is highly resistant to corrosion and oxidation, regardless of how the metal is quenched. One such process results in a product that, when polished, has the appearance of nickel or chrome plating but will not lose the finish by flaking or cracking. This process will be widely applied to bolts, nuts and many other hardware items that will be subjected to outside use. Imagine a nut and bolt on your automobile license plate that will come apart readily year after year! Several variations as well as entirely different processes for nitriding and otherwise furnishing a wear-resistant surface and a tough, ductile body will also be widely used.

Control will be refined and extensively applied so that the entire heating process will be foolproof and require less intensive supervision. This will impart even more exact properties to the heat-treated parts

These give some idea as to what can be expected to become part of the universal production picture in the next few years. But there are at least two—and probably many more—techniques still very much in the laboratory stage that are expected to have wide repercussions in the more distant future when they become commercially available. Probably first to arrive is a controlled atmosphere annealing process during which the material being heated will acquire a corrosion-resistant finish. This finish will result from a reaction between the material being heated and chrome, zinc, nickel and other vapors suspended in the atmosphere.

Another step in the trend toward lower temperature and more accurate heating is an attempt to heat-treat in a vacuum. Just how this will be done is not yet known, but it is considered as a distinct possibility. Advantages would be a purer steel and surer results from heat-treatment as the vacuum would draw-off gaseous impurities in the steels. This, it is believed, will permit the use of lower temperature heating and consequently further reduce the likelihood of distortion in the product.

Quenching

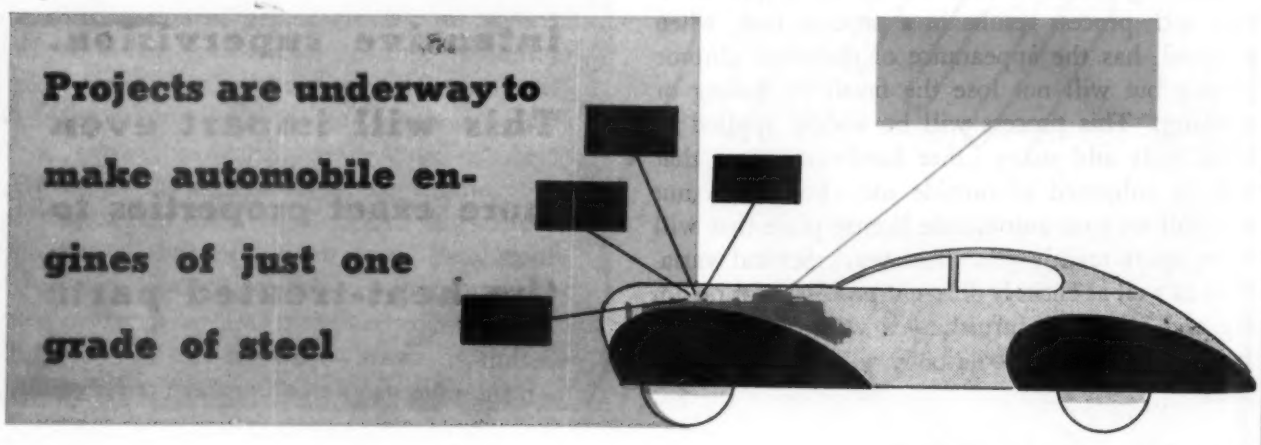
As most of the progress and future development in quenching is closely allied with furnace heating it should probably be discussed before passing on to other heat-treating methods. Most certain to occur in quenching are controlled, precision quenching, fog quenching and bright gas quenching.

Experimentation and observation have shown that much of the distortion, cracking and flaking of heat-treated parts occurs during quenching. These reactions sometimes result from parts being cooled too rapidly, sometimes too slowly and other times from a combination of the two as might occur in quenching a cylindrical object which is closed at one end. Control of all types of quenching will overcome most of these difficulties. To assure swift cooling, agitation of the quenching medium or passing it through a heat-exchanger is being used, especially when continuous-type furnaces are employed. Timing in the quench, with either batch or automatic type equipment, is also to be carefully regulated after metallurgical studies indicate just what the proper quench time is.

Development to come in the field of quenching is the interrupted salt bath quench now being used on wire products to result in a product that is reasonably hard but which is also tough and ductile. By this technique cooling is stopped at a predetermined point by quenching in a heated salt bath. This halts the transformation from austentite to martensite at an intermediate stage and has an effect that could not be attained by any other method of quenching. It is quite likely that variations in this process will be adapted to many other products.

The shortage of capacity of the seamless tube mills lead to the use of welded tubing for aircraft. Welding the tubes resulted in the need for a normalizing operation and at first the tubing was cooled in still air under a controlled atmosphere. This was not fast enough so a method of forcing cold gas over the hot steel was developed and provisions made to dispose of heated gases. By the use of proper gases, oxidation was avoided and a bright-finish tubing resulted. Gas quenching is expected to have great influence over the quenching of thin metal stampings and other thin-section parts and will probably overcome most of the difficulties encountered in quenching such parts.

Also to be used for quenching thin stamping is a method known as fog quenching. In this process a fine mist of water will be sprayed on the part. By controlling the rate of spray, speed of cooling can be made to conform to requirements.



There will be much further study of precision quenching so that exact hardness can be secured in the quench, so that distortion will be practically eliminated and so results can be duplicated at will.

Salt Bath Heating

Salt bath heating will be used much more extensively under certain conditions in tomorrow's heat-treating department as industry and its technicians continue to search for methods of heating without distortion. Limiting factors to its greater use are the facts that rather large production is required to make its use economical and that it cannot be used in continuous operations. It will be used for carburizing, annealing, reheating, tempering and neutral hardening.

Probably the greatest application of salt bath heating will be for carburizing and for some selective hardening. It can also be used for heating without oxidation or decarburization, as the molten salt forms a protective film over the metal part when it enters the bath and when it is removed from the bath and transferred to a quench. The salt film is washed off in a water quench but must be removed by special treatment after an oil quench.

For carburizing large parts, salt baths may replace pack carburizing, as similar results can be obtained. Cases to a depth of 0.040 in. are obtained in four hours, but carbon penetration up to 0.125 in. can be obtained if desired.

Induction Heating

The use of induction heat is due for continued expansion in the future and, though for some time it will be confined to selective heating and small parts, there are possibilities that it will be applied to heating large loads.

There will be further mechanization of induction heating units and they will continue to be placed logically in production lines. Too, induction heating units for hardening will be used even more extensively in the future for small lot production—prospects being that such units can be used economically on lots as small as 12 or 15 pieces, if good tooling is provided.

It is likely that both high- and low-frequency heating units will be used in any fair-sized heat-treating department. Low-frequency types will be used where a deep penetrating action is desired and high-frequency machines where a skin or shallow heating effect is required, or where extremely sharp contours must be followed. As with some types of conventional heating furnaces, induction heating units will often serve in dual roles—as heat-treating units and for brazing. Thus, they can be kept busy longer in the event that neither function requires full productive capacity.

It is conceivable that two or more types of heating will be used conjunctively on the same parts when the scope of each is more clearly defined

While induction heating units have been considered chiefly for use on comparatively small parts, application to extremely large parts has been attempted, because of war necessity, and found successful. As an example, a low-frequency unit is being used to harden teeth of a 30-ft. ring gear. A large fixture indexed the gear so that one tooth at a time is hardened.

Induction heating units are well suited to production line application because of their speed, cleanliness and small size. It is likely that units will be developed to supply power to a number of working stations that can be spotted for most advantageous use.

Steel to be hardened by induction heating has a carbon range of from 0.40 to 0.50 percent. This will help push the trend toward steel simplification and elimination and reduction of inventories containing many types of alloy.

With the addition of induction heating units to high-speed production lines will come the development of synchronous loading and heating fixtures that carry the parts through the unit with little or no supervision. In some cases hopper arrangements will be provided to feed parts of symmetrical

shape to the heating station. After the heating and quenching cycle the part will drop onto a discharge conveyor and carried away to an inspection or assembly station. By proper fixture and coil design several parts can be heated and quenched in the same period of time once required to handle just one part.

Many parts not formerly heat-treated by induction will be so heated in the future through modified design which makes the process applicable. Fixture design will also reach the point where many parts of complex contour can be satisfactorily hardened. Proper fixture design will also permit brazing and hardening at the same time, effecting worthwhile time savings.

Flame Hardening

Two exigencies of war have given the stepchild of heat-treating processes a chance to come forward and prove itself. The lack of alloy steels and the urgent need for any and all heat-treatment equipment, resulted in many plants relying on flame-hardening. As a consequence, this method of hardening will be retained and many new applications found for it in the plant of tomorrow.

Several inherent advantages—adaptability, simplicity and portability—plus the development of new techniques and new controls will throw the vote, in choosing equipment toward flame-hardening in many circumstances.

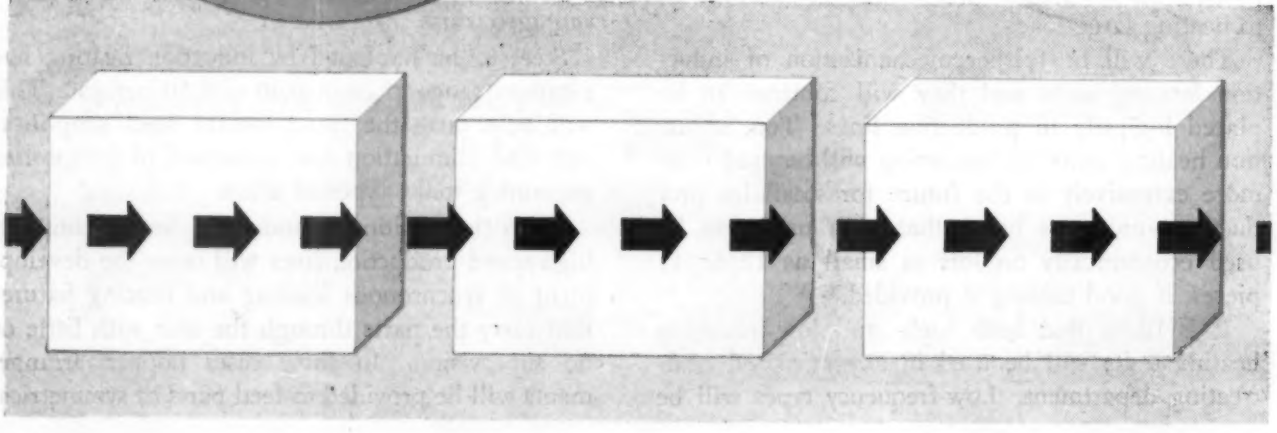
One important perfection of technique, which combines heating, quenching and drawing and does them at one place, in one fixture and at the same time, with no material handling, widens the useful scope. Too, its ability to harden pieces heretofore impossible or too costly to harden by other existing methods will permit better products—products which never before had the benefits of heat-treatment. Size, generally speaking, is no bar to the use of flame-hardening. It can be used for most types of localized hardening and for thin-sectioned pieces that would warp under other practical types of heating.

Control over heating temperatures, volume, pressure and temperature of quench, and drawing temperatures makes its possible to duplicate results of flame-hardening as to depth of penetration and hardness.

Shortly before war production demanded primary attention, flame-hardening was becoming an important factor in adding to the life and accuracy of machine tools. It was used to harden ways and other bearing surfaces of lathes and other production machines. This permitted greatly accelerated production, in many instances, by permitting grinding and hardening to take the place of laborious, time-consuming hand scraping.

Flame-hardening will permit taking hardening to the work rather than always taking the work to the heat-treating equipment. This, too, fits in with

A most significant change is shifting heat-treating to its logical place in production lines

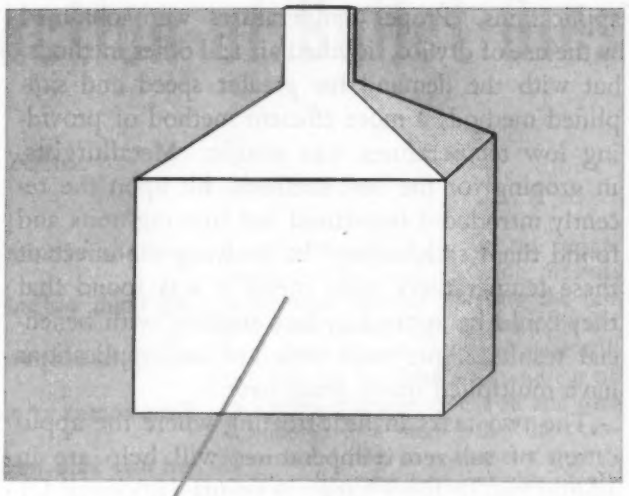


the trend to fit heat-treating into the production line and makes it possible to do so on large parts where material handling cost is extremely high—for example machine tool beds, large gears, propeller shafts, axles and oil-well drill stems.

This hardening method can be extremely simple or rather complicated as far as equipment is concerned, depending upon the job. For jobs that are only done at rare intervals, a simple oxy-acetylene welding torch can be used with some equally simple quenching method. For higher production, precise fixtures that move the part or the heating unit can be developed with a minimum of engineering. Various types of flame nozzles will permit a variety of heating effects and quenching will be applied in several ways, straight water quench, water with compressed air for a mist effect, and compressed air alone.

Steel simplification adds to the possibilities of flame-hardening. As a case in point there is the plight in which the railroads found themselves during the war. Rail frogs were always made of manganese steels to provide the toughness necessary to withstand sudden shocks caused by locomotive and car wheels striking them at comparatively high speeds. When manganese steels became difficult to get, carbon steels, flame-hardened, were substituted. They have been so satisfactory that their use will undoubtedly continue in the postwar era. Too, the application to other railroad uses will become more general in the shops and along the right of way.

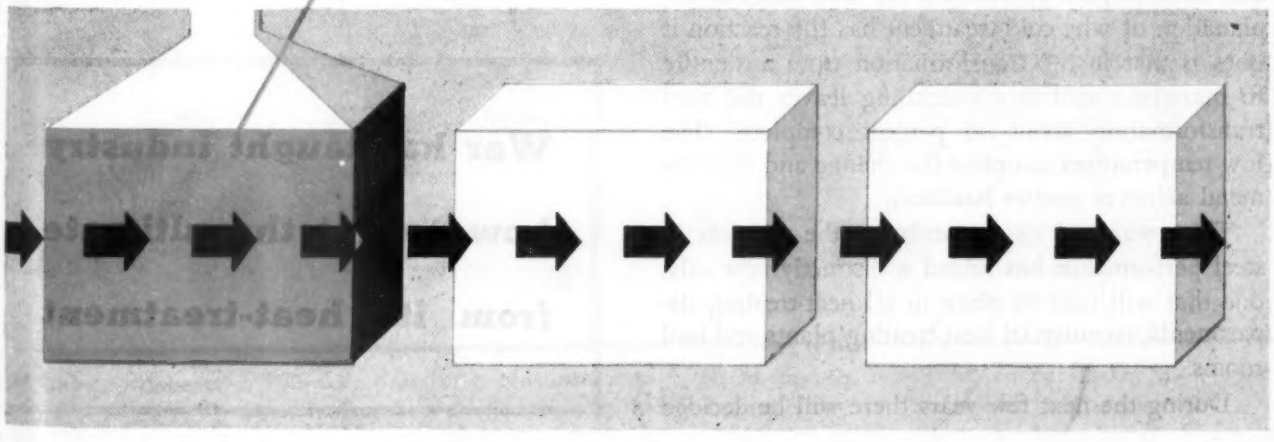
When economics are again a factor, flame-hardening will certainly get the choice in circumstances where there is not a great volume of heat-treating to be done. Why? First the equipment is lower in cost, regardless of method competing, and, second, the basic ingredients of the process can be used for three important functions—heat-treating, welding and the application of hard facing alloys. The latter are likely to be used more in rebuilding or providing original surfaces which must withstand extremely hard wear. Thus, the equipment can be utilized to the fullest extent and idle standing time can be cut to the minimum.



Cold-Treatment

The newest departure in heat-treating practice and one which developed directly through war production is the application of cold-treatment as a final step in the hardening of metals. Its use is so new that its potentialities are not yet fully recognized, but one thing is certain—it will be used in every heat-treating department or tool room where it is necessary or desirable to obtain maximum hardness or inhibit growth in the piece being treated. Hardness obtained in this manner does not make the metal more brittle, as might be presumed, but increases its ductility.

Sub-zero temperatures have been used for some time in shrink-fitting parts and other specialized



applications. Proper temperatures were obtained by the use of dry ice, liquified air and other methods, but with the demand for greater speed and simplified methods a more efficient method of providing low temperatures was sought. Metallurgists, in groping for the best methods, hit upon the recently introduced household fast-freezing units and found them satisfactory. In studying the effect of these temperatures upon metal it was found that they could be applied to heat-treating with beneficial results. Since then their use and applications have multiplied many times over.

The two tasks in heat-treating where the application of sub-zero temperatures will help are in adding two or three hardness points (Rockwell C) to the metal and for accelerating the aging of metals to inhibit growth. The latter use it now confined largely to gage manufacture, but is believed that it will be used considerably in treating ground-fit parts in highly precise equipment. In applying cold-treatment, the size of the part is literally and figuratively frozen by the temperature of about —120 F. that are used.

Some manufacturers now refuse to use any tools that have not been subjected to cold-treatment. They claim increases of from four to five times in tool life between grinds on tools so treated. Manufacturers of cutting tools will probably have to equip themselves with freezing units to meet competition in supplying the best possible tools. Some tool buyers now cold-treat new tools before initial use, if they cannot purchase them so treated.

In applying cold-treatment, parts are heat-treated in the usual manner, quenched down to room temperature and then plunged in the freezing unit and held at —120 F. from a few minutes to three hours. Drawing and recooling may be necessary in some cases, but this is a point of procedure on which standard practice has not been yet determined. The cold-treatment, in addition to increasing hardness and ductility of the part, stops growth and warpage and relieves pent-up stresses. A metallurgical explanation of why cold-treatment has the reaction it does is that in the transformation from austentite to martensite ordinary quenching leaves the final transformation about 90 percent complete. The low temperatures complete the change and thus the metal achieves greater hardness.

Thus, war and its demands for the ultimate in steel performance has added a distinctly new ally, one that will take its place in all heat-treating departments, commercial heat-treating plants and tool rooms.

During the next few years there will be decided steps forward in the equipment and application of all types of heat-treating equipment, regardless of type. Many of the expected developments have been cited as well as the trends they forecast. Other trends, which need little or no explanation, can be summarized as follows:

Tool rooms will depend on controlled atmosphere furnaces to stress relieve and anneal high-speed steels before initial use in an attempt to return the steels to their original state. Too, finished tools are likely to be given the same treatment.

Although fewer alloys will be used, those that are used will be more specific and complex, requiring the utmost in care and control to heat-treat them satisfactorily, as the working range for heat-treating will be considerably more narrow than now.

By having available steels with better surfaces, many early machining operations will be unnecessary. Closely controlled heat-treating will eliminate some final machining. Combined, these two factors, plus probable material savings, will reduce final costs considerably.

A constant fight will be continued against distortion in heat-treated parts and there is the distinct possibility that this will be achieved through the use of lower temperatures and better control over quenches. As this fight is won, the cost of heat-treating and subsequent operations will go down.

Light metals, copper and copper alloys will no longer require extraneous gas generators to produce bright surfaces. The same results will be obtained by the use of direct-fired convection furnaces, using closed circuits.

War has taught industry how to get the ultimate from heat-treatment. These lessons will be applied to peacetime production, thus salvaging from war some permanent contributions to the science of metal working and making it possible to produce better products for a better world. It will be interesting to watch these changes come over industry and see just how far-reaching will be the effects.

War has taught industry how to get the ultimate from its heat-treatment

Hobbing Speeds Production of Bullet Dies

BY JOHN ZUBELL

Dies hobbed to eliminate contour machining and grinding must be lapped between rough and finish hobbing operations to remove all tool marks. Tungsten dies can be resized to compensate for wear

THE MANUFACTURE of bullet jacket dies in quantities large enough to meet the vast demand for 0.30 and 0.50 caliber ammunition has been a critical production problem. The adoption of tool steels with 3½ to 5 percent tungsten, instead of using straight carbon tool steels, has been a partial solution because tungsten steels have greater wear resistance and require fewer reconditionings, with the result that a fewer number of dies are required for a given production. Furthermore, tungsten-steel dies have a tendency to shrink on hardening; therefore, they can frequently be shrunk enough on rehardening to compensate for wear, allowing them to be reused for the same size die.

The fabrication of bullet dies, regardless of the type of steel used, has also been a critical production problem. The following methods are used generally:

1. Drilling, reaming and lapping.
2. Drilling, reaming, hobbing and lapping.
3. Drilling, reaming, grinding and lapping.
4. Double hobbing and lapping.

Double hobbing eliminates contour drilling and reaming, since the cavity in the dies is made with a hob contoured to the shape of the bullet jacket. Hobbing is done on a hydraulic press operating at a pressure of 1,750 lb. per sq. in. for rough hobbing, and up to 1,000 lb. per sq. in. for finish hobbing.

The setup for hobbing the dies is shown in Fig. 1. Hob *A* is a sliding fit in holder *B* that slides in guides *C*. The holder is centered by a dowel fitted to spring clip *D*. The bullet die is set up as shown and centered by a V-block behind the die. As the ram on this particular press ascends, the hob enters the drilled ejector-pin hole and irons the bore to shape. Stops *E* control the depth of penetration. As soon as contact is made between the stops, an electric circuit is closed by contact between pointer *F* and spring clip *G*, thus lighting bulb *H*. At the instant this circuit is closed, hydraulic pressure is released, thereby lowering the ram and withdrawing the hob from the die.

The die is made from tool steel drill rod that can be shouldered and cut off in a screw machine, or cut off and then shouldered in a small lathe. It is centered and drilled to a diameter slightly smaller than the required size of the ejector-pin hole. To facilitate the hobbing operation, the die is dipped in copper sulphate, and the hob and ejector-pin hole are well greased. The first or roughing hob is usually 0.015 in. smaller than the finishing hob, while the latter is 0.0015 in. larger than the required size of the finished die. The die will shrink to final size when quenched by clamping it in a fixture and running water through the bore. Tool marks left when drilling the ejector-pin hole will be ironed into the rough hobbed cavity. These marks, as well as those left by the hob, must be lapped out and the surface finished to a high polish before final hobbing. The die should again be dipped in copper sulphate, and the cavity of hob well greased, prior to hobbing. The straight sections on both the roughing and finishing hobs should be tapered 0.0015 in. to facilitate removal of the

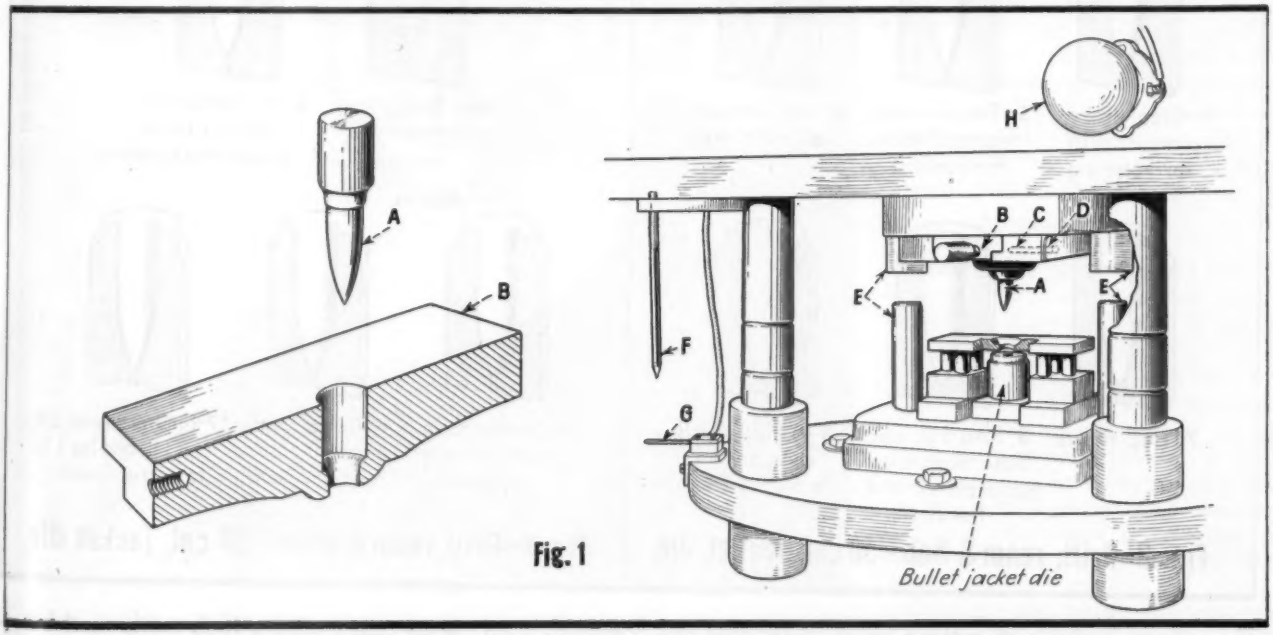


Fig. 1

Hobbing is done on a hydraulic press at a pressure up to 1,750 lb. per sq. in. for 50 caliber jacket dies. Hob penetration is controlled by stop blocks between the ram and platen

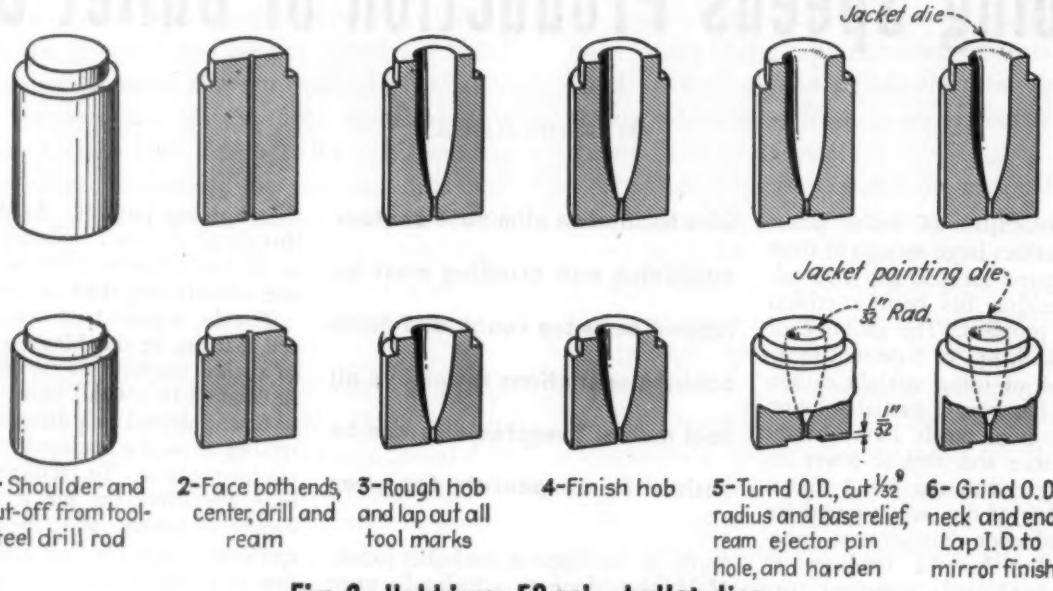

Jacket die
Jacket pointing die
1/32" Rad.
1/32"
1- Shoulder and cut-off from tool-steel drill rod
2- Face both ends, center, drill and ream
3- Rough hob and lap out all tool marks
4- Finish hob
5- Turnd O.D., cut 1/32" radius and base relief, ream ejector pin hole, and harden
6- Grind O.D. neck and ends. Lap I.D. to mirror finish

Fig. 2- Hobbing 50 cal.- bullet dies

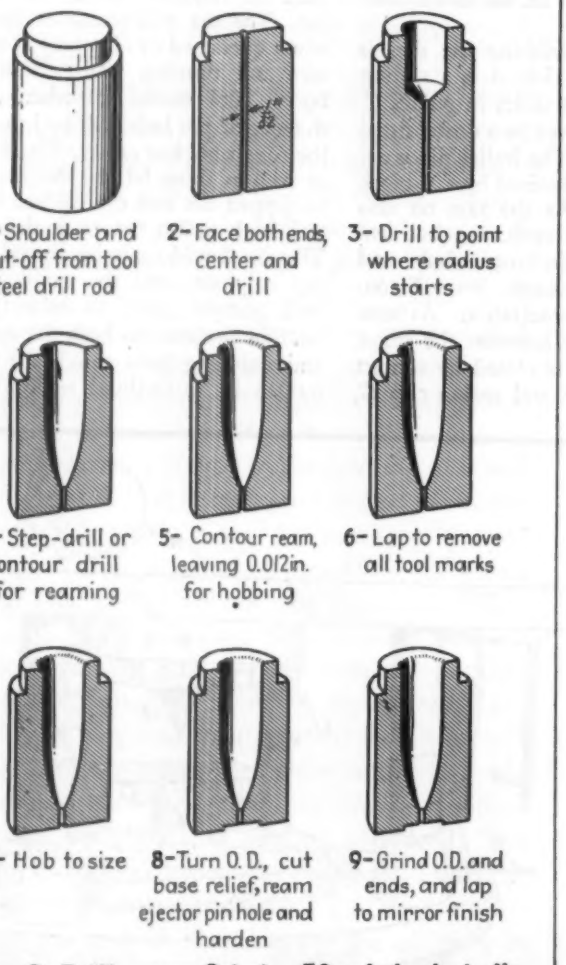

1- Shoulder and cut-off from tool steel drill rod
2- Face both ends, center and drill
3- Drill to point where radius starts
4- Step-drill or contour drill for reaming
5- Contour ream, leaving 0.012in. for hobbing
6- Lap to remove all tool marks
7- Hob to size
8- Turn O.D., cut base relief, ream ejector pin hole and harden
9- Grind O.D. and ends, and lap to mirror finish

Fig. 3- Drill, ream & hob - 50 cal. jacket die

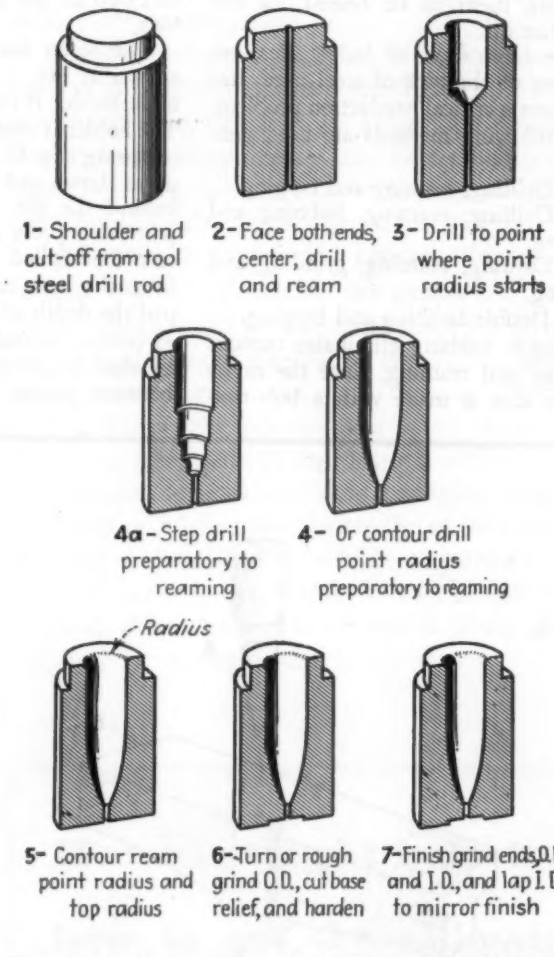

1- Shoulder and cut-off from tool steel drill rod
2- Face both ends, center, drill and ream
3- Drill to point where point radius starts
4a- Step drill preparatory to reaming
4- Or contour drill point radius preparatory to reaming
Radius
5- Contour ream point radius and top radius
6- Turn or rough grind O.D., cut base relief, and harden
7- Finish grind ends, O.D., and I.D., and lap I.D., to mirror finish

Fig. 4- Drill, ream & grind - 50 cal. jacket die

These three methods of making bullet jacket dies are commonly used. In all cases, minute tools marks must be removed from the bore by lapping. Tool steel with 3½ to 5 percent tungsten is favored because of high production per die and because the die can be resized to compensate for wear

hobs from the dies. The taper thus left in the die is eliminated when the die is quenched.

After final hobbing, the die is turned to finished diameter, a 1/32 in. radius is cut at the mouth of the die cavity, the base is recessed for a depth of 1/32 in., and the ejector-pin hole is reamed to size. These operations are indicated in step 5 of Fig. 2. After hardening, the dies are ground to required outside diameters, the ends are ground, and the cavities are lapped to a mirror finish.

Recommended Heat-Treatment

Regardless of the size or shape of the dies, the heat-treating operation is extremely important and probably is the cause of as much trouble as any other single operation in the manufacture of tungsten-steel bullet jacket dies. Improper heat-treatment can cause severe warpage and distortion.

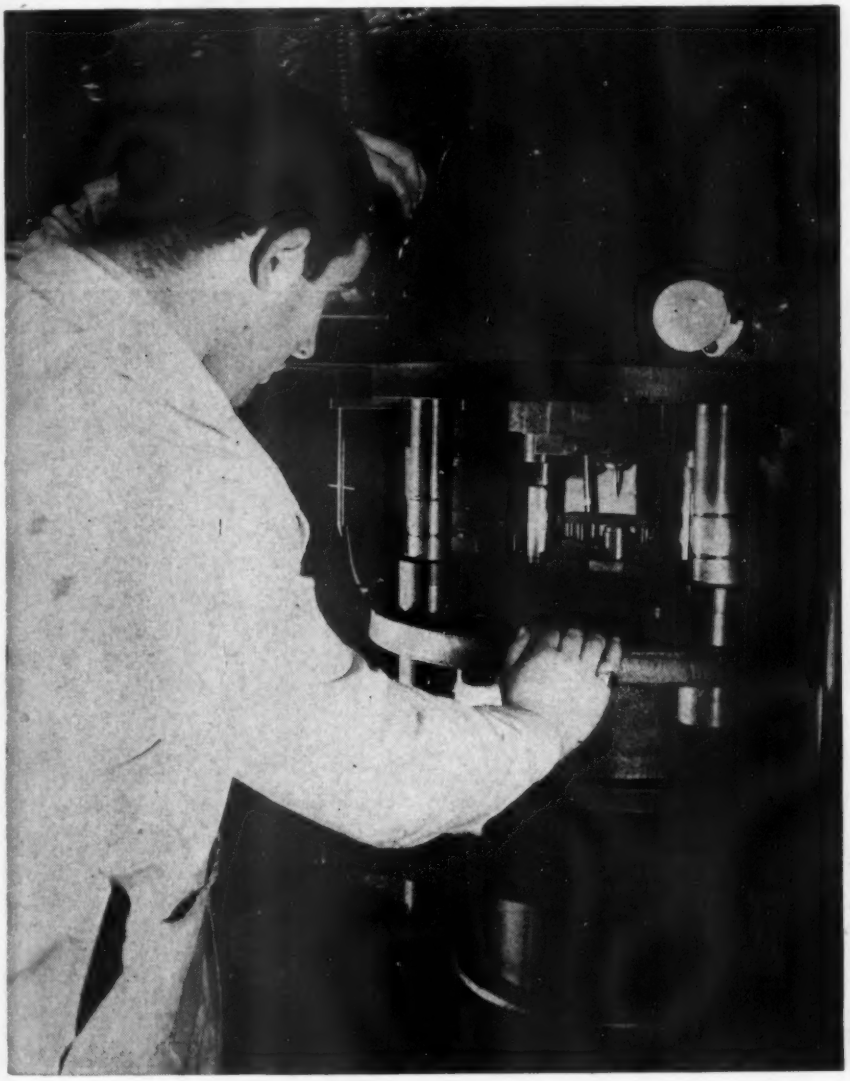
The following heat-treatment for bullet jacket dies made from tungsten tool steel is recommended by the Massachusetts Steel Treating Corporation:

1. Stress relieves the die before hardening.
2. Heat the die in a lead bath to approximately 1,525 F.
3. Place the die in a quenching fixture, and force water through the bore under pressure for approximately 40 sec. In every case, the water spigot should be the same size as the smallest diameter of the bore.
4. Place the die in a brine solution and allow it to soak for about 20 sec. The solution should contain five percent brine by weight.
5. Remove the die from the brine and place it in warm water for a few minutes.
6. Test the die for Rockwell hardness at three points at the end of the die—at the hole, halfway to the outside diameter, and at the outside diameter. Most tungsten-steel die requirements are 62 to 65 Rockwell C at the hole, about 55 C halfway to the outside diameter, and 35 to 40 C on the outside diameter.
7. The die should be tempered as soon as possible after quenching, at least within an hour.

Fig. 3 shows the steps for making bullet jacket dies by drilling, reaming and hobbing. After drilling the ejector-pin hole, excess stock is removed by first using a straight drill and running it to the point where the radius begins. The hole can be drilled further by straight drills of decreasing diameters or contour drilled, leaving about 0.015 in. for reaming plus 0.012 for hobbing—a total of 0.027 in. Gun reamers, made of carbon steel drill rod, contoured to the shape of the bullet jacket, and hardened to 64-65 Rockwell C, have proved satisfactory. The hole can also be roughed by boring, using a cam to control the path of the boring tool; afterwards, the hole is reamed, leaving 0.012 in. for hobbing.

Prior to hobbing, the cavity must be lapped to remove all tool marks. After hobbing, the outside diameters are turned to size, the base relief is cut, and the ejector-pin hole is reamed to size. The die is then hardened as described previously, and after the outside diameters and ends are finish ground, the cavity is lapped to a mirror finish.

Some bullet dies have been completely finished by reaming and lapping. When using oil-hardening steel, the dies are rough reamed to within 0.006 in. of final size, and finish reamed to within 0.001 in. of final size. After hardening, the die is lapped to size. When using water-hardening steel, the same size roughing reamer can be used, but the cavity is finish reamed 0.001 in. oversize. The die will shrink on quenching, leaving enough stock for lapping.



When hobbing bullet dies, the hob enters a 3/32 in. hole drilled for the ejector pin and irons the bore to rough size. This is followed by a second hob that shapes the hole to final size

Grinding Bullet Dies

Many bullet jacket dies are finished by grinding. The steps used in this method are shown in Fig. 4. When the die cavity has been reamed, the outside diameters turned, the ends faced, and the base relief cut, the die is hardened. Usually, 0.003 in. is allowed on the inside diameter for finishing, of which 0.0025 in. is removed by rough grinding and 0.0005 in. by finish grinding. Grinding data based on information presented by the Norton Company follows:

Grinding the outside diameter and the ends of the die is required to finish it to exact dimensions for the die holder, and to remove light scale

formed during heat-treatment. A relatively fine grit and soft-grade aluminum-oxide vitrified bonded wheel should be used. Because of the unusual hardness and resistance to abrasion offered by tungsten steels in the hardened state, a wheel feed of not more than 0.0005 to 0.001 in. per pass should be used, and the wheel dressed carefully with a diamond. When surface grinding the ends of the dies, and when grinding the outside diameter by either the cylindrical or centerless methods, flood coolant should be used; otherwise, the dies will overheat and grinding cracks will develop.

Most plants manufacturing bullet jacket dies that are to be ground allow 0.003 in. on the inside diameter for grinding after heat-treating. It is advisable to leave at least this much stock for grinding to insure removal of all tool marks.

Diamond Wheels Recommended

Grinding the inside diameter of tungsten steel dies has been a source of trouble to many concerns. While both silicon-carbide and aluminum-oxide abrasive wheels have been used with some measure of success, they cannot be considered entirely satisfactory for production grinding. If the wheels are hard enough to prevent rapid breakdown, thus making it difficult to grind a straight hole, then they are apt to glaze and will not cut freely. The objections to vitrified bonded wheels appear to have been overcome by using diamond resinoid bonded wheels.

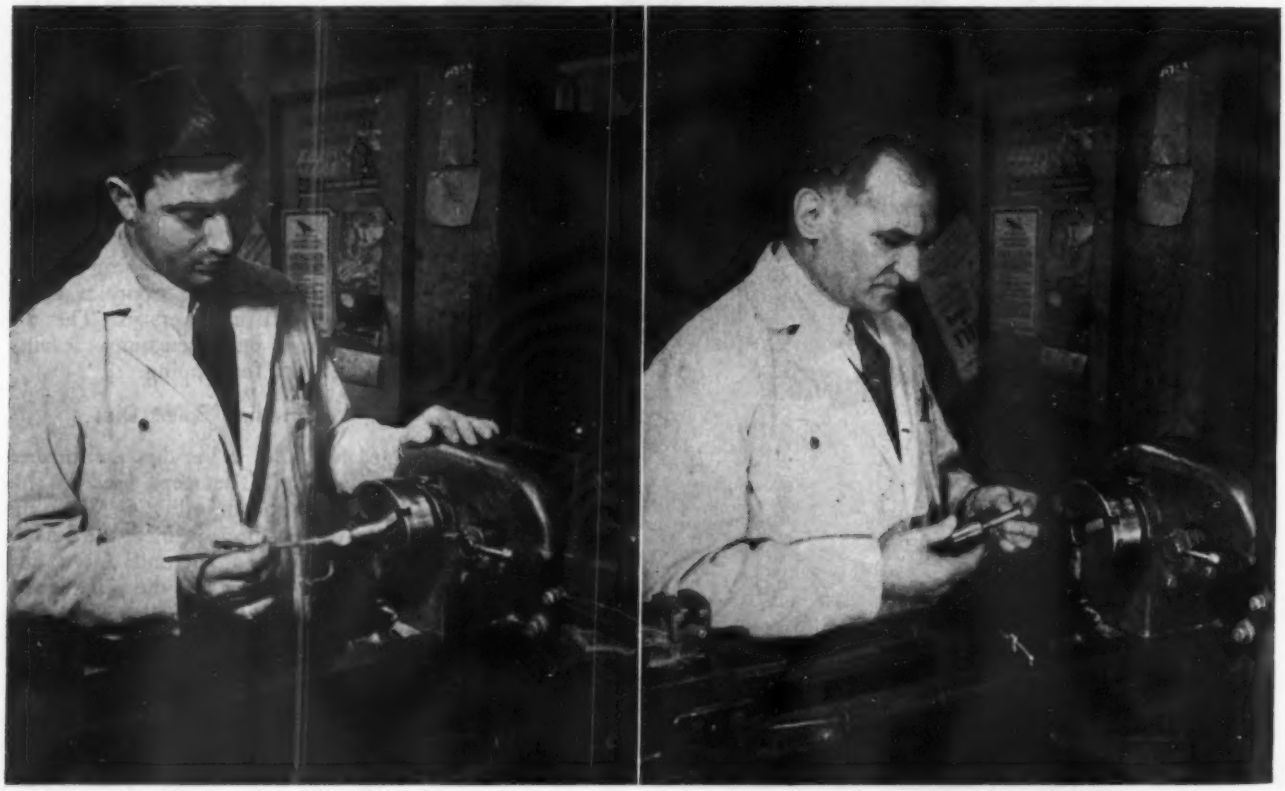
For rough grinding, a 100-grit diamond wheel is recommended. Although the initial cost is considerably greater than that of a vitrified bonded wheel of the same size, it more than pays for itself because it has greater stock-removal capacity and longer service life under proper conditions.

Following are recommendations and precautions that should be observed when using diamond resinoid bonded wheels for rough grinding the bores of tungsten steel bullet jacket dies

1. Operate wheels up to ½ in. diameter at approximately 25,000 r.p.m., and wheels from ½ to ¾ in. diameter at approximately 12,500 r.p.m.
2. Operate the work at approximately 400 r.p.m.
3. Indicate the periphery of the diamond wheel to run true within 0.0005 in.
4. Use slip collets for rapidly mounting and accurately holding the die while grinding.
5. Grind wet, using a flood of soluble-oil coolant having 80 parts water to one part oil. Greasy solutions should be avoided because they smear the wheel face and retard the cutting action.
6. Use a wheel spindle of as short a length and as large a diameter as practicable.
7. Use a table traverse speed of 20 to 40 in. per min.
8. Frequently dress the 100-grit diamond resinoid wheel lightly with a piece of pumice or a fine soft silicon-carbide abrasive stick.

For finishing grinding the bore of bullet jacket dies a 500-grit diamond resinoid wheel is recommended. While used in the same manner as the 100-grit diamond wheel, it should not be considered a stock-removing wheel and should not be expected to remove more than 0.0005 in. from the diameter to bring the hole to size.

Although an exceedingly high finish can be obtained with the 500-grit diamond wheel, some radial scratches are apt to be left, and these must be removed. Aluminous abrasive flours in 600 grit and finer are being used in some plants for lapping to produce the required finish. In some cases, the laps are cast-iron and the lapping vehicle is a medium grade lubricating oil. In other cases, fine cotton is wrapped on a pointed wooden stick and dipped in the lapping compound. Also, resinoid bonded diamond honing sticks in 220, 320 and 500 grit sizes are used.



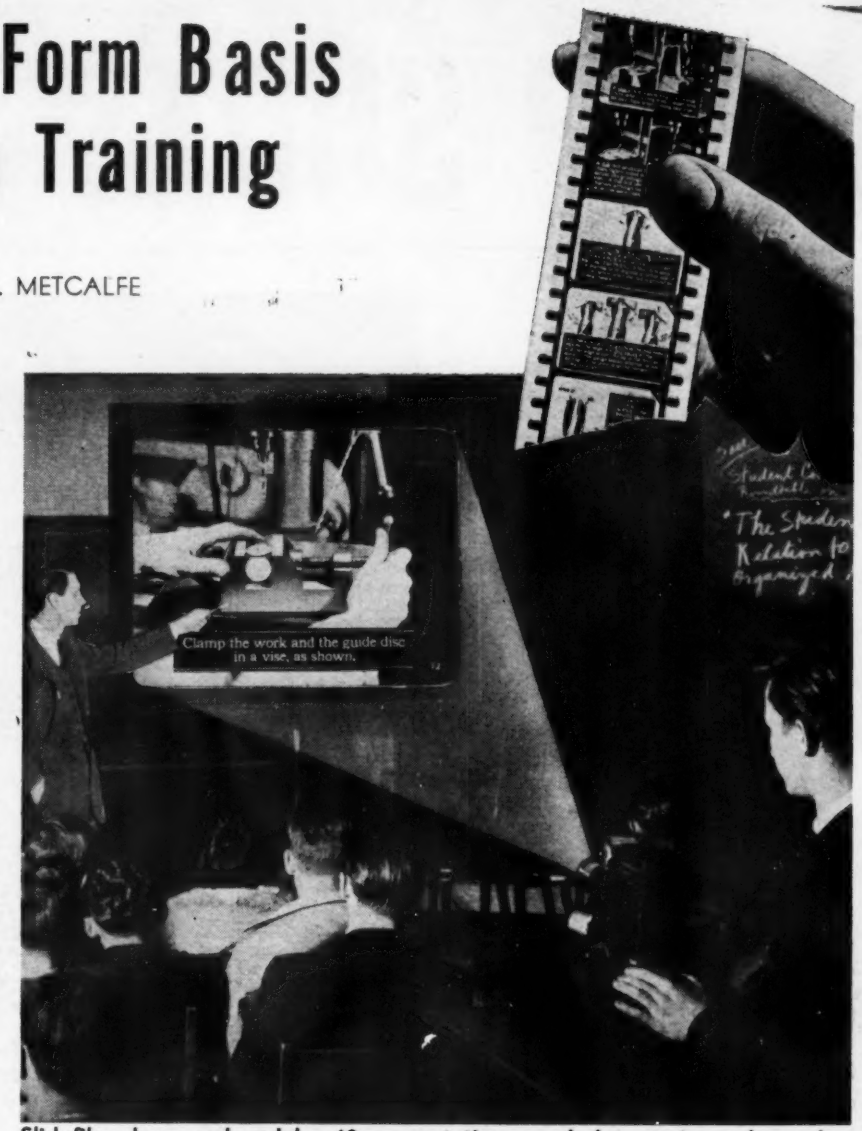
Dies can be lapped as shown here with cotton wrapped on a pointed stick and saturated with lapping compound. Cast-iron laps and resinoid diamond lapping sticks are also used. Standard plug gages check the bore contour and finished size of both bullet jacket and pointing dies

Slidefilms Form Basis For Shop Training

BY LYNE S. METCALFE

THE USE OF SLIDEFLIMS to teach fundamental practices in machine tool and other metal-working operations saves as much as 40 percent of the time generally needed to train production workers. Training classes properly organized for slidefilm instruction also increases the efficiency of skilled workers. Experiments to determine the advantages of this training technique have been conducted at Lawrence Institute of Technology, Highland Park, Mich., under the supervision of instructors from the Long Manufacturing Company, Division of The Borg-Warner Corporation.

The course covers 20 weeks and is based on the discussional slidefilms listed in the table. Aside from teaching the fundamental practices in metal-working operations, the pictures are tied in with time studies, motion studies, and the preparation and use of analysis or job sheets. The latter practice prevents the slidefilm showing from becoming boresome to workers intimately acquainted with the machines.



Slidefilms have reduced by 40 percent time needed to train workers when courses are organized properly. They help increase efficiency of skilled workers, and aid in making time and motion studies

Classes are conducted in a lighted room so the trainees can see to write notes; however, the room is sufficiently dark to prevent screen glare that would detract from the clarity of the pictures. Groups are kept small so that everyone can see the screen and hear the instructor clearly. Each slidefilm is a self-contained unit and brings to the screen for the benefit of a large group those steps in the operation and study of any one machine that otherwise could be shown effectively to but three or four trainees at a time. Slidefilm showings and classroom discussion are of course supplementary to actual machine shop training.

One advantage of the slidefilm is its flexibility. The instructor can stop or reverse the film to meet his personal style of instruction; also, the pictures incite class participation in the various subjects studied.

Visual aids have recently been adopted for courses in methods engineering at Lawrence Institute as a result of the success attained with the training slidefilms discussed here. Time and motion studies are stressed, as well as the preparation and use of process charts and analysis sheets.

All slidefilms are strips of 35-mm. safety motion-picture film, each frame of which contains a picture—a photograph, drawing, diagram, chart or other pictorial exhibit with superimposed lettering, labels or notations. The pictures are arranged in progressive sequences, providing the instructor with basic illustrations of machine tools, including functional operations, accessories and set-ups.

Slidefilms for Training Courses

BENCHWORK SERIES:*

1. Tools
2. Hand and Power Hacksaws
3. Drills and Drilling
4. Reaming, Tapping and Threading
5. Finishing Rough Castings
6. Scraping
7. Rivets and Riveting
8. Layout Tools and Measuring Instruments
9. Layout Work, Parts 1 and 2

MACHINE TOOL SERIES:**

1. The Machinist
2. Machine Tools
3. Machine Technique, Parts 1 and 2
4. Measurements and Measuring, Parts 1 and 2
5. Drill Presses, Parts 1 and 2
6. Grinding Machines
7. Lathes, Parts 1 and 2
8. Milling Machines
9. Shapers
10. Planers
11. Special Machines (Turret Lathes)
12. Other Special Machines

* *Each slidefilm averages 88 frames.*
** *Each slidefilm averages 44 frames.*

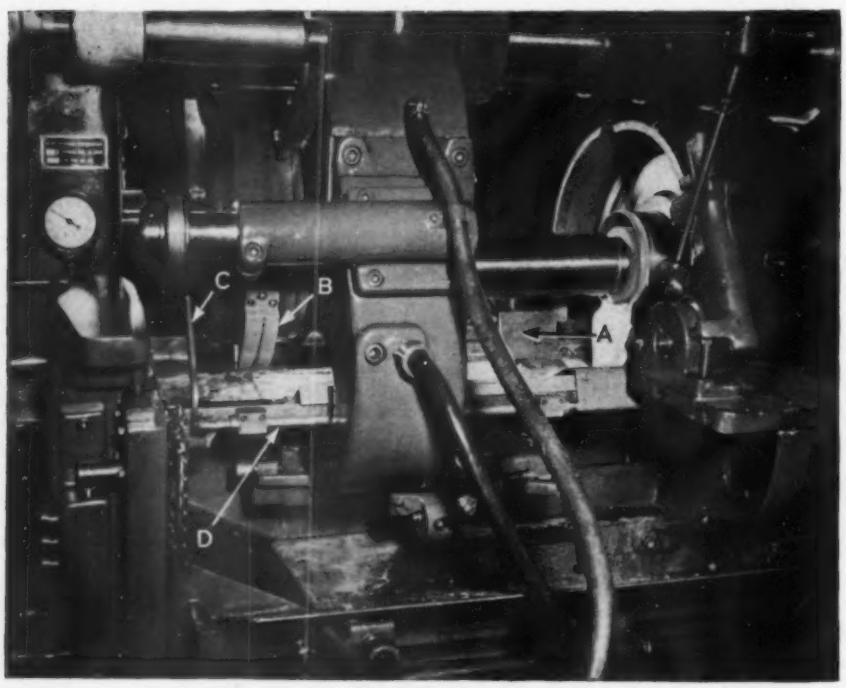
SHOP SHOTS

FROM AN AIRCRAFT ENGINE PLANT

Manufacture of automobile bodies, as performed at the Seaman Body Plant of the Nash-Kelvinator in peacetime, did not include many metal-cutting operations. The working force was largely made up of punch press operators, sheet-metal workers, upholsterers and body finishers. This plant is now converted to metal-machining operations in the manufacture of parts for radial aircraft engines and has trained its employees to work efficiently with machine tools.

Despite lack of familiarity with machining operations, these men have worked out a number of innovations which have permitted increased production. In addition they have brought about safer working conditions. Some of these are illustrated on these two pages.

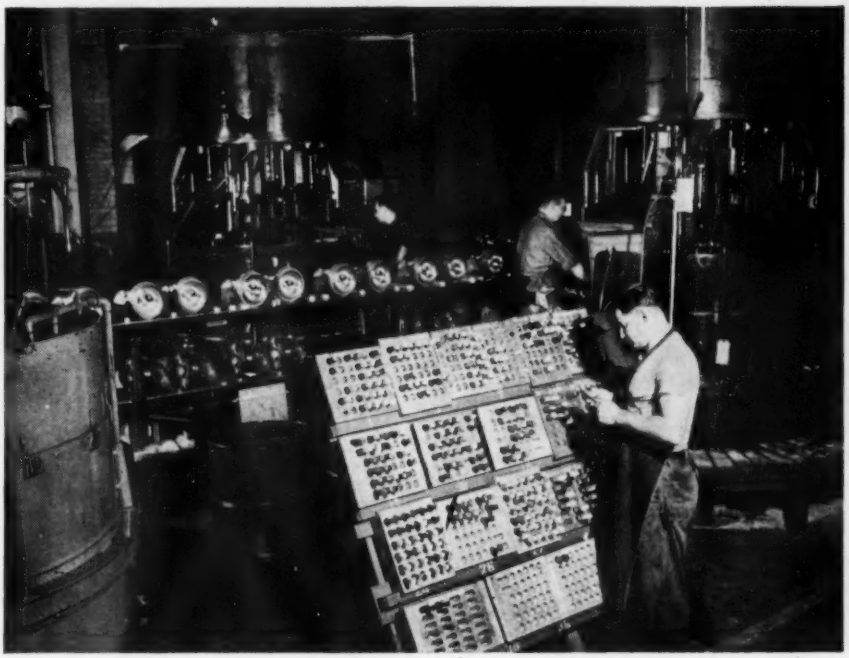
High-speed machining of aluminum and magnesium parts on turret lathes means that large quantities of chips are thrown away from the work with considerable force. To eliminate this hazard, Nash employees have developed an enveloping guard with hinged sections which permit it to be opened for changing workpieces and setting tools. The part being machined in this set-up is a diffuser assembly for an aircraft engine



Guards which automatically swing into position and protect the operator's hands while positioning aircraft engine cylinder barrels in the chucks of Bryant internal grinders are credited with a share of the low accident rate in the Seaman Body Plant. When the spindle head of the grinder is returned from the work and swung out of position, the guard *A* is swung up in front of the wheel by action of the cam *B* striking the arm *C* at the end of shaft *D*. Guard *A* and cam *B* are made from sheet steel. Even though the grinding wheel is not stopped between operations, there is no danger of the operator's hands coming in contact with it

Speed of setting aircraft engine cylinder barrel forgings in the chucks of Bullard Mult-Au-Matics has been improved by providing an alignment gage *A* which is permanently supported from a bracket *B* at the loading position of the machine. When ready to position a new piece, the area *A* is swung in so that three stops position themselves under the skirt of the forgings. This squares the forging in the chuck jaws and eliminates checking the piece in relation with its axis of rotation

Serrated chuck jaw inserts made of hardened high-speed steel insure a tight grip on the aircraft engine cylinder forgings in this Mult-Au-Matic set-up. Also shown in this view is the swinging alignment gage which insures accurate positioning of the piece in the chuck jaws without further attention on the part of the operator. When the chuck is indexed to the first machining position, the alignment gage is swung out of the way automatically



Bullard Mult-Au-Matics are employed for machining cast aluminum aircraft cylinder heads and forged steel cylinder barrels. Sharp tools are needed in considerable quantities to keep these machines operating efficiently. To eliminate the time which ordinarily would be taken by set-up men going to the toolcrib, racks have been placed at several points in the department. Each board on the rack carries a standard carbide-tipped tool for a machine set-up. Extra boards are provided for dull tools. Usually, the cutting surfaces of these tools are protected by wrapping with paper tape, which is removed when the tool is set up

Ground Spherical Fits Reduce Manufacturing Time

BY J. R. MILLER, WORKS MANAGER, LINK-BELT ORDNANCE COMPANY

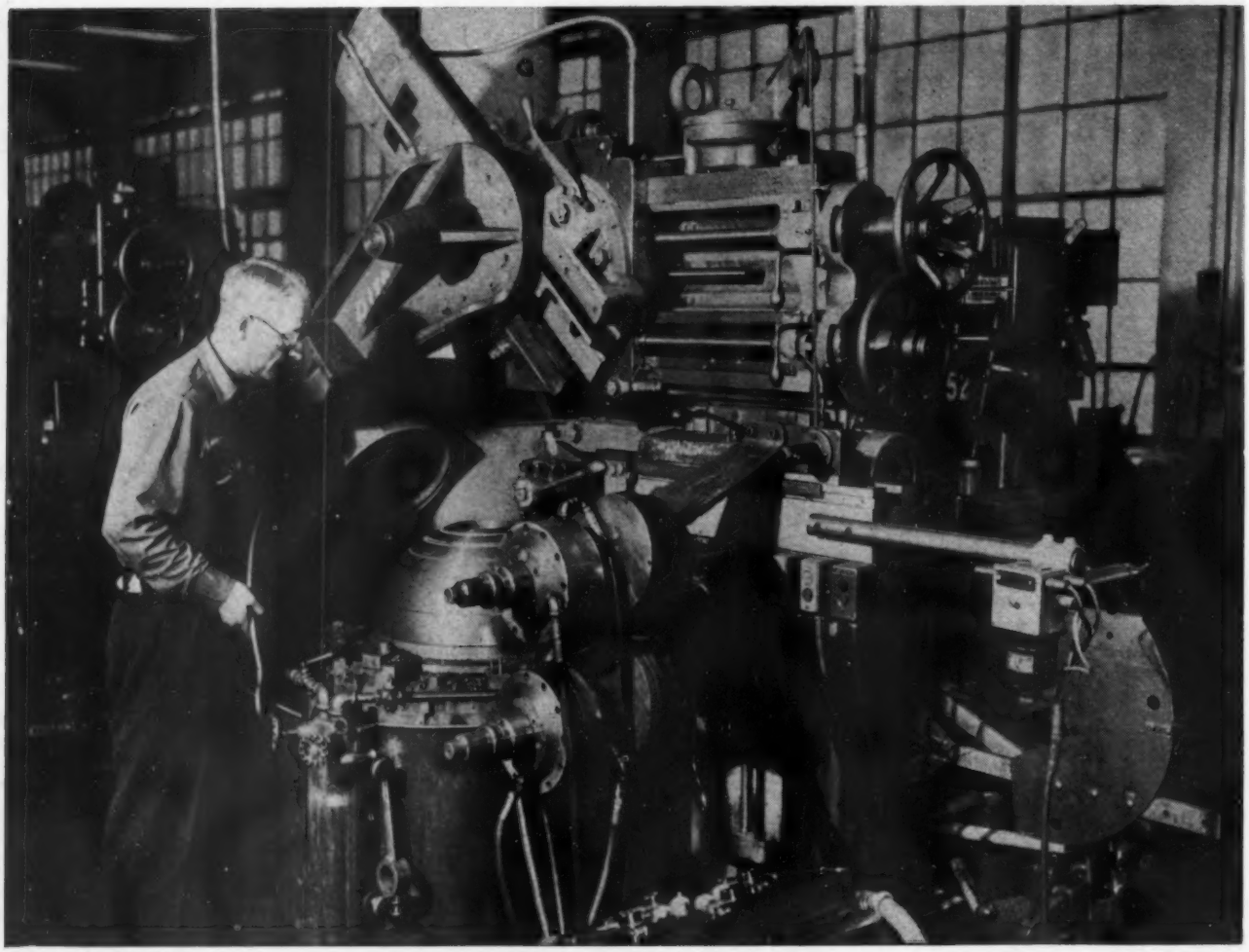


Fig. 1—This set-up is used to rough and finish turn the convex member of a leveling bearing for a gun carriage. The grinding wheel carried on the top ram finishes the spherical bearing zones on these pieces

MANUFACTURING TIME for 90-mm. anti-aircraft gun carriages has been reduced 10 to 15 hours each, in a Link-Belt Ordnance Company plant, by using two grinding operations to achieve fits of spherical parts formerly mated by lapping. The parts involved form the gun's spherical leveling bearing. Another valuable result of grinding is interchangeability of parts which was not attained when the concave and convex surfaces were lapped to assure a close fit.

Grinding of spherical zone surfaces on these ball joint members is done

Interchangeability of parts is also achieved by elimination of lapping to fit mating concave and convex bearing surfaces on 90-mm. anti-aircraft gun unit

with cup wheels by a procedure based on these geometric principles: (*a*) The intersection of two spherical surfaces is a circle whose plane is perpendicular to the line which joins the center of the spheres and whose center is in that line, and, (*b*) When the axis of a cone or cylinder passes through the center of a sphere, the intersection of the cylinder or circular cone with the surface of the sphere is a circle whose center is on the axis of the cone or cylinder. Following these principles, it was found that if a cup wheel is rotated about an axis which passes through the center or a rotating spherical zone, the end of the wheel will contact the spherical surface about a small circle of the sphere and, as the wheel removes metal from the

work, it will generate a truly spherical surface.

In practice, the cup wheel is dressed on its end to produce a narrow conical surface that is tangent to the spherical surface of the ball. In grinding the concave surface of the socket member, the wheel wears away and assumes a conical shape which is tangent to the work surface about a small circle. It has been found necessary to use a grinding wheel of sufficient diameter to overlap on each side of the spherical zone being ground. This gives the wheel a chance to clear itself during the period when it is clear of the work. Feed must be slow and metal removal light or the wheel will load rapidly due to the large arc of contact on each side.

Bullard 36-in. vertical turret lathes are used for most operations on the cast iron-alloy ball member of the leveling bearing. This part is hollow and has a maximum hardness of 250 Brinell. The first operation consists of rough and finish boring a small spherical zone inside the casting and turning and facing the skirt. For this work, a spherical boring head is mounted in place of the turret on the machine's vertical ram. Facing and turning operations on the skirt are done with carbide-tipped tools carried by the side-head ram of the mill.

A Detroit Universal hydraulic duplicator attachment controls movements of the side-head ram for turning operations through a large templet. The first rough turning removes from ¼ to ½ in. of metal from the spherical surface, with the work rotating at 37 r.p.m. The cutting tool in the side-head follows a 11⅛-in. radius for an arc length of about 13¼ in. When several ball members have been rough turned, the lot is taken to a drilling machine, where bolt holes are drilled in the skirt. After drilling, they are returned to the vertical turret lathe for finish turning and grinding the spherical surfaces. For finishing, the work is rotated at 47 r.p.m. and about ⅛ in. of metal is removed.

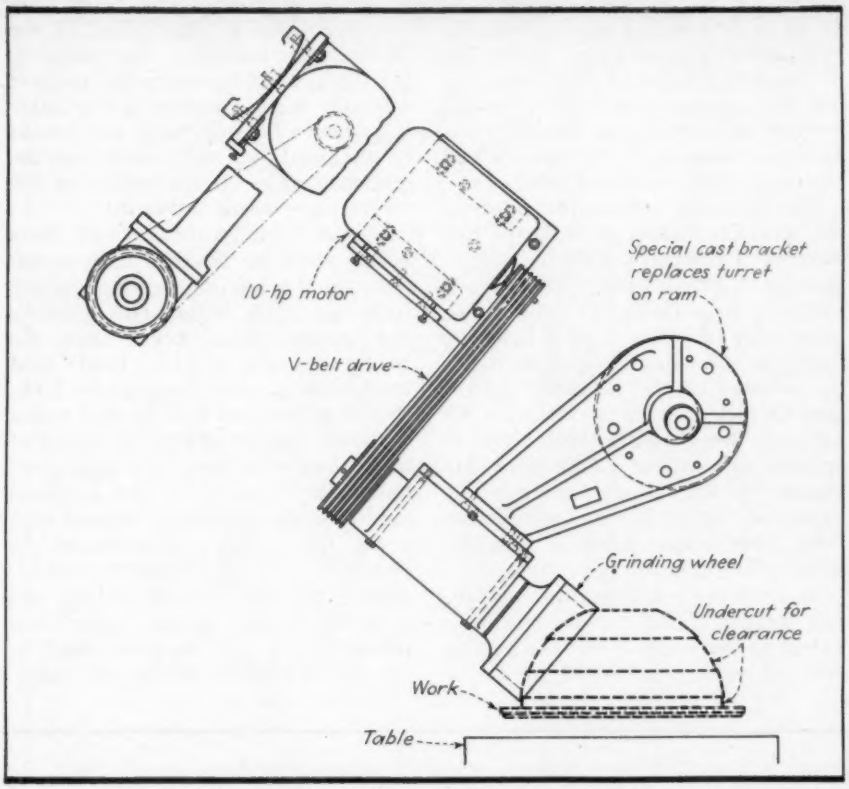


Fig. 2—This grinding wheel spindle and drive is mounted on the ram of a 36-in. mill for grinding the spherical bearing surfaces on the ball member

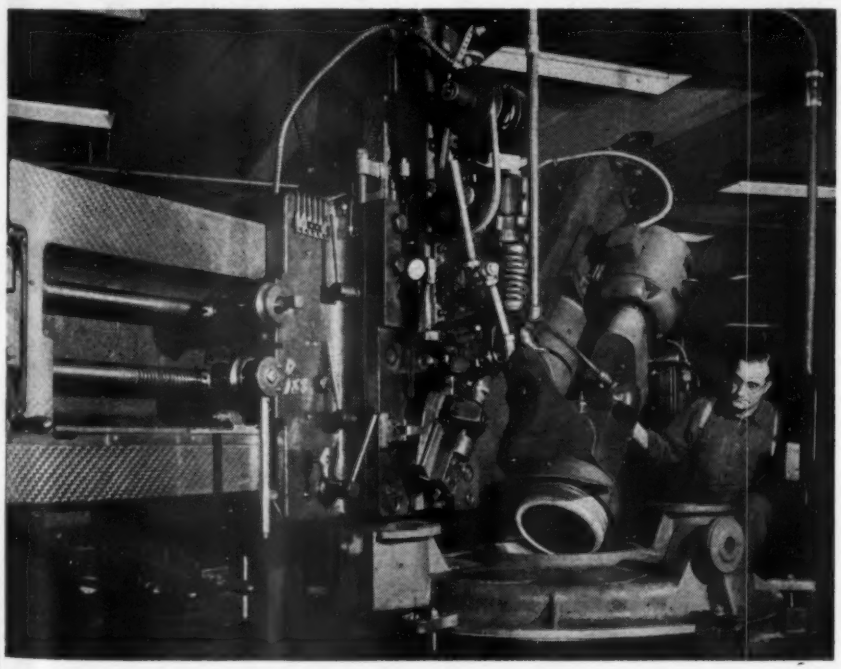


Fig. 3—Concave spherical bearings in leveling bearing castings are finish bored and ground in this set-up on a fixed-rail Betts boring mill. Each tool head must be accurately centered with the work when it is used

The templet governing movement of the turning tool is so stepped as to leave two undercut spherical zones and two spherical bearing zones which must be finished by grinding. The grinding wheel is carried on a special bracket mounted on the turret on the mill's ram. This ram is set at an angle of 40 deg. to the axis of the table and supports the grinding wheel spindle so that its center of rotation intersects the axis of work rotation at the center of the sphere being ground. During the grinding operation, the wheel removes approximately 0.005 to 0.008 in. of stock from the surface of the bearing zones. This operation requires from 40 to 75 min. because of the slow rate of metal removal. Conical chamfer in the end of the cup wheel is held to a maximum of ⅜ in., to minimize the area of contact between work and wheel and thus reduce the amount of heat generated during grinding. The specified radius to which the ball joint is made is 11 in., but it has been found best to make the finished radius, on the bearing zones of the ball, about 0.001 in. less than

11 in. Likewise, the radius of the finished socket is made 11 in., plus 0.001 in., to insure equal clearance between the two mating members when assembled and obviate the possibility of having a snug fit at the bottom and clearance at the top of the joint.

The grinding wheel for finishing the spherical bearing areas on the ball member is driven by a 10-hp. motor, through V-belts. The wheel is carried on a large Ex-Cell-O spindle. The motor may be mounted on a baseplate bolted to the ram casting or bolted to the crossrail of the machine. As the ram on this machine is used only for carrying the grinding wheel and its spindle, the saddle is dowelled and clamped to the rail after the exact location of the bracket and spindle has been determined. Likewise, the ram is dowelled to its 40-deg. angle.

In assembling the gun carriage, the ball member of the leveling bearing is bolted to the pedestal and the mating, leveling casting is bolted in an inverted position to the bottom of the top carriage member. The leveling, bearing casting, in which the concave spherical bearing surface is machined, is a heavy alloy steel piece which must be machined so it will center with the machined areas on the bottom of the top carriage within 0.002 in.

Special fixed cross-rail 78-in. Betts boring mills are used for most operations on the leveling bearing casting, including finish boring and grinding the concave bearing socket. Both the boring and the grinding heads used in this set-up were designed by Link-Belt engineers and built to their specifications. Rough and finish boring of the ball socket is done with high-speed tools and in each case, the left-hand saddle on the crossrail is located with a pin fitting into a bushing in the crossrail. The ram is then located for vertical position and the boring tool is set for position against a gage block placed on top of a hardened block in the fixture on the boring mill table. When boring, the work is rotated at 14 r.p.m. and about 0.005 to 0.008 in. of stock is left for removal with the grinding wheel.

The grinding head carries a 13-in. diameter cup wheel on an Ex-Cell-O spindle driven by a 10-hp., 3,600 r.p.m. motor connected to the spindle by V-belts. When set-up in grinding position, the saddle carrying grinding spindle is located on the rail with a pin like that used for locating the boring head. The ram carrying the spindle is permanently set at 45 deg. with the axis of the work and the axis of rotation of the grinding wheel passes through the axis of rotation of work so that the wheel will generate a truly spherical zone.

For the 13-in. diameter wheel used in this operation, the spindle is driven at 1,470 r.p.m. and table speed is between 4 and 5 r.p.m. When setting up to grind a ball socket, the wheel is fed against the work until tool marks are removed. Then a plate gage

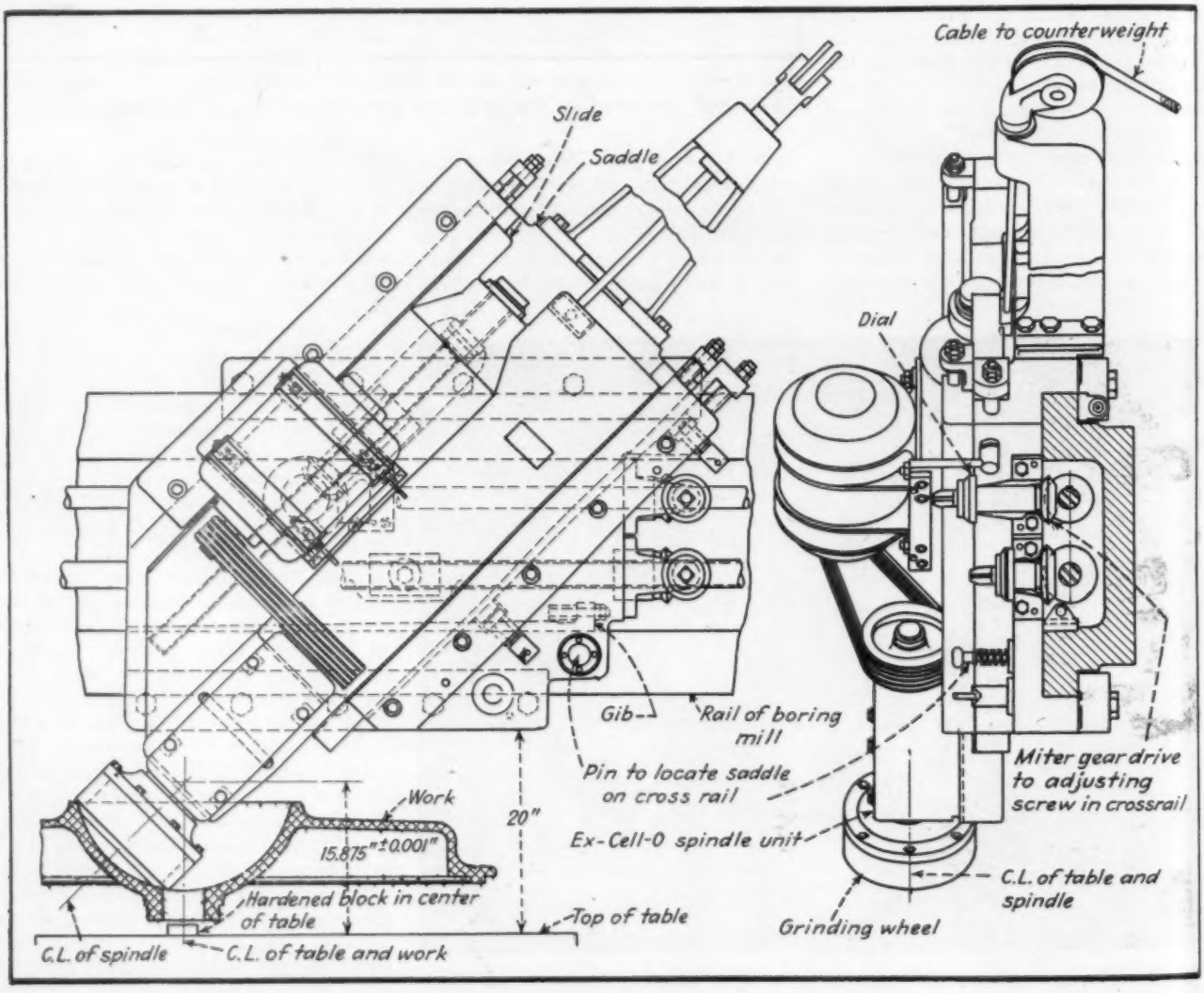


Fig. 4—This is the grinding head for the boring mill shown in Fig. 3. A 10-hp. electric motor drives the Ex-Cell-O grinding wheel spindle

ground to 11.000 in. radius is used to determine the amount of stock remaining. When the amount of stock to be removed is determined, the wheel is fed into the work for this amount, according to the dial reading on the feed screw for the grinder ram. When this point is reached, the wheel is allowed to "spark out" and it is then removed from the work for final gaging to the spherical zone with the plate gage and a feeler. The radius of the gage used to check the socket is 0.002 in. larger than the gage used to check the ball unit. This insures equal clearance throughout the bearing area when the two pieces are assembled.

Diameters of wheels used for the two grinding operations on the ball and in the socket are not critical. Wheel diameter need only be small enough to enter the work, but it must be large enough to overlap at the two edges of the spherical zone being ground. An open-bond wheel generally gives best results as it does not load so rapidly. Starwheel dressers are used to clean up the wheel when it loads. As when grinding the ball member, the size of chamfer on the wheel must be kept fairly small when grinding the concave areas of the sockets. Overheating and loading result when the chamfer is too large and it is also possible for the grinding load to become too great for the motor.

An interesting machine was developed for lapping spherical clamps to the spherical fit inside the ball member of the leveling bearing. This unit has a 1½-hp., 1,740 r.p.m. motor driving a Link-Belt reducer and a right-angle bevel gear train connecting to an eccentric driver. This driver rotates at about 41 r.p.m. A plate bolted to the clamp piece is flexibly connected to the driver shaft extension. Rotation of the driver causes the clamp pieces to rotate and oscillate inside the ball casting. The variable speed motor allows rotation and oscillation to vary to produce a satisfactory finish. A Flexapulse timer controls the motor to give a 5-min. rotation in one direction and then reverse for the same period of time. After the 10-min. lapping cycle has been completed, the parts are separated and the mating surfaces cleaned with a fluid made up of equal parts of carbon tetrachloride and oleum spirits, to remove all grit.

As a final step, the two parts are reassembled in the lapping machine and light machine oil is spread over the mating surfaces. The machine then automatically goes through another 10-min. cycle, half in each direction. Parts lapped together are marked for identification and shipped to the assembly floor.

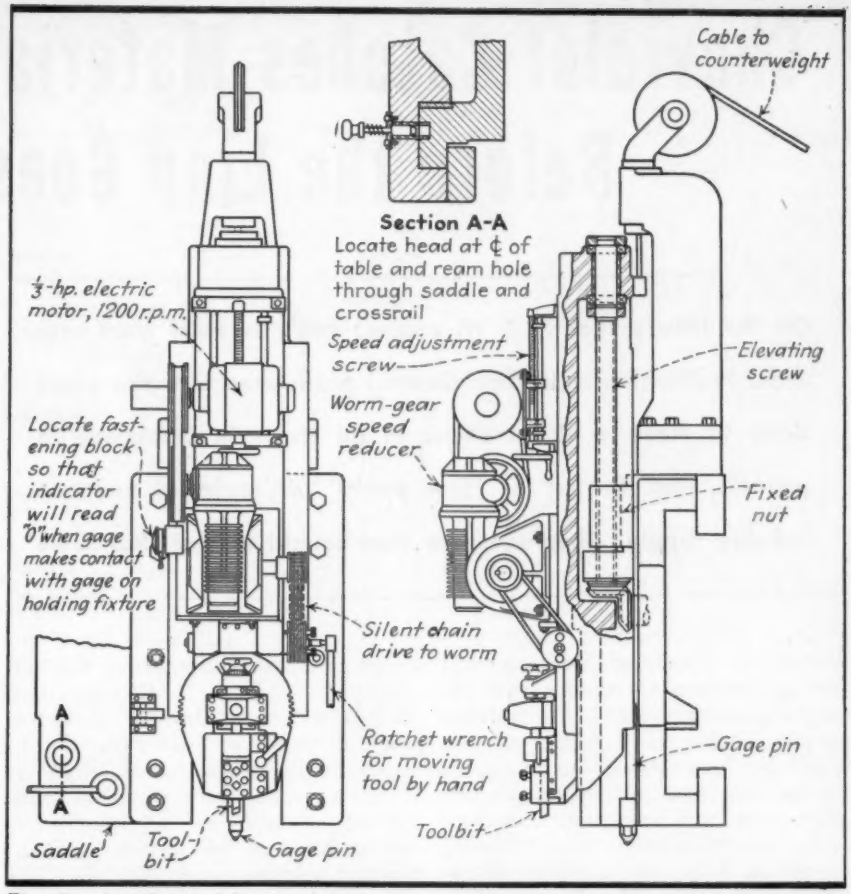

Cable to counterweight
Section A-A
Locate head at ℄ of table and ream hole through saddle and crossrail
⅓-hp. electric motor, 1200 r.p.m.
Speed adjustment screw
Elevating screw
Worm-gear speed reducer
Locate fastening block so that indicator will read "0" when gage makes contact with gage on holding fixture
Fixed nut
Silent chain drive to worm
Ratchet wrench for moving tool by hand
Gage pin
Saddle
Tool-bit
Gage pin
Toolbit
A
A

Fig. 5—A spherical boring head is mounted on the left-hand saddle of the boring mill shown in Fig. 3. A 1/3 hp., 1200 r.p.m. motor drives this unit

Fig. 6—Link-Belt engineers developed this automatic-cycle lapping machine for finishing the fit between the leveling clamp and a spherical surface inside the leveling bearing ball

Chevrolet Catches Materials Shortages Before the Line Goes Down

On the theory that P. & W. engines can't be built from records, Production Materials Control sends men into the plant daily to make a visual check of all items in stock and in process, and to list as "low parts" all material under a ten-day supply. Shortages are thus caught before shut-down

MATERIALS CONTROL has proved a knotty problem to many plants engaged upon war work. The services require deliveries against definite schedules, but prime and subcontractors may have had little peacetime experience with repetitive manufacture, particularly where it is necessary to operate with a restricted float of material in process. For this reason a number of firms have sought information from the automotive companies, which have had many years of experience along this line.

Essentially, the motor-car manufacturer must employ a materials-control system that is simple but provides an up-to-the-minute picture of shortages existing at the start of a given production period. Nominally, the material procurement program for passenger-car production is laid out three months ahead, upon the basis of sales predictions. Assemblies are set up on the basis of a protective bank based on location of supplier. Production within the ten-day period immediately ahead may be considered fixed, and parts manufacture and final assembly in the second and third ten-day periods may be adjusted up or down to suit consumer demand as revealed by ten-day sales reports.

Under these conditions, management can not tolerate a materials-control system that produces figures several days after checks are made. For by the time that shortages are discovered, or errors are found in the figures, it will be too late to make good the deficiency, and final assembly operations suffer.

In shifting to war work, the Chevrolet Division of General Motors Corporation found it expedient to continue its material control system which emphasizes assemblies during the ten-day period. Under CMP regulations it is necessary to schedule material to the full extent of orders placed. In practice this means that materials releases are made for a period of seven to nine months, and adjustments are made later as the services raise or lower production quotas. But the Chevrolet plants and their vendors are expected to produce against the short-term schedule.

How the Chevrolet system works can be related in connection with the Pratt & Whitney engine program. Final assembly of the engine is handled at Buffalo. Chevrolet plants there and in other cities supply parts to the final assembly plant, and of course a great number of vendors do likewise. Since engines off the assembly line constitute the important criterion, materials control for the Pratt & Whitney program is handled at Buffalo.

The Production Materials Control Section performs these functions:

1. Issues authority to affiliated plants to procure materials and produce parts against the P. & W. production schedule for engines, original spare parts, and "second-year" spare parts.

2. Compiles shortage lists of finished parts at the assembly plant, and prepares shortage lists for raw materials at Buffalo parts-manufacturing facilities. At plants outside the Buffalo region, local materials-control sections take care of raw-materials shortages.

About 25 persons now work in the Production Materials Control section at Buffalo. This is four times the number of prewar employees; the increase being due to complexity of the wartime production, greater number of items to be checked and the current problems of supply. All of these persons are experienced in the operation

FINISHED PARTS REQUIRED FOR ASSEMBLY—PLANT 1

Date of Report—March 20, 1944—7 A.M.
Items Under 1000 Jobs

Starting with Engine No. 20,000

Part No.	*Description*	*Pieces per Job*	*On Hand*	*Sub Assys. Ahead*	*Green Line Engines*	*Source*
48347	Cyl. Head, Rear	7	77 (134 Plant E)	5	12	Plant 1
74621	Gear	1	111	0	27	Plant B
38926	Bearing (*400 jobs at Plant B*)	2	170	0	0	Vendor A
30066	Gear Assembly	1	189	0	25	Plant 2
16583	Line Impeller	1	376	13	30	Plant C
85598	Carburetor	1	550	0	0	Vendor B
25124	Screw	1	591	0	27	Plant D

Note: Some components are produced in more than one Chevrolet "parts" plant contributing to the Pratt & Whitney program.

The shortage list is compiled daily, and reports status of items in less than ten-day supply.

RAW MATERIAL SHORTAGE—MOTOR AND AXLE PLANT

Date of Report—March 20, 1944
Items Under 1000 Jobs on Machine Floor

Part No.	Description	Pcs. per Job	On Hand	Source
19320	Strainer	1	0	Vendor A
	260 in process			
	1110 on hand Plant 1; 53 Subassembly			
68210	Plug	2	0	Vendor B
	710 in process			
	486 on hand Plant 1; 54 Subassembly			
20034	Red. Gear Support	1	37	Plant H
	198 in process			
	942 on hand Plant 1; 9 Subassembly			
31353	Plate	1	212	Vendor C
	1395 in process			
	635 jobs on hand Plant 1			
92825	Crankshaft	1	558	Vendor D
	2799 in process at Motor and Axle			
	1050 on hand at Plant 1			
	81 in Subassembly			
	This shortage list is compiled daily			

of a mass-production enterprise. Since some 260 parts are made at Buffalo in addition to engine assembly, the follow-up work is divided, so that certain people specialize on certain items. Their duties can be summarized as follows:

1. Aid in preparation of daily shortage lists for distribution to department heads and materials supervisors.

2. Get in touch with department heads to double-check reports originating from stock-record clerks and tell department heads what they must produce today to protect tomorrow's assemblies.

3. Telephone and wire affiliated plants and vendors to cover items reported on shortage.

4. Issue stop orders on material affected by engineering changes or changes in schedule.

The telephone is used liberally for communication with affiliated plants and vendors. Confirmation is later sent in writing.

Shortage lists are of two kinds: (1) finished parts required by the assembly plant, and (2) shortages of raw materials existing in manufacturing plants at Buffalo.

The parts-shortage list gives the actual count of low parts on hand, the pieces per job, as a check against the ten-day supply. It is compiled from figures furnished by trained shortage checkers, who, working at night, make a visual check of finished components in stockrooms and at various stages of subassembly. Their reports indicate the actual number of pieces on hand. The difference between this figure and the number of jobs that will be required during the ten-day period is then the worry of the PMC follow-up man and the department head producing the part. This report keeps local parts plants abreast of their jobs. Materials supervisors know the production capacity of their plants and what is in transit from affiliated plants and vendors.

The raw-materials shortage list notes the amount of material awaiting the first operation in parts-manufacturing plants, starting with the morning shift, comparing stock with a ten-day supply. For example, the accompanying record shows that for a certain strainer, material is on hand for no part but 260 are in process, and the final assembly plant has over 1100 strainers on hand. These figures are compiled by visual inspection of stock on hand, not from records.

No chances can be taken of a future shut-down of final assembly for lack of strainers. It is known that the supplier of raw material has been having difficulty keeping up with demand from several engine plants. So the PMC man responsible for the strainer checks with the vendor and obtains in-transit information and promises for future delivery, and makes a report to supervision if the outlook is unfavorable for delivery of raw material on time. Although the PMC is responsible for follow-up with vendors and transportation agencies with respect to raw materials in advance of the item appearing on shortage, serious shortages disclosed by the visual checker give the PMC man the opportunity for a double check.

Reports of raw-materials shortages go into detail concerning the number of pieces in process or on hand at the final assembly plant because some jobs require considerable processing time. Therefore it is desirable to have a bank in some instances. In the case of crankshafts a temporary lack of material at the first operation is not serious because some 2000 pieces are in various stages of completion. Yet a sudden step up in production in engines or spare parts might run into a snag. Therefore the source for forgings must be queried, and information obtained by PMC on the situation there.

Chevrolet finds that the use of shortage lists compiled in the fashion described will disclose shortages from five to six days ahead of a possible shut-down, thereby giving all concerned time to rectify the situation.

High or Low Milling Speeds

Recent developments in high-speed milling must not be taken as applying to all work of this kind. Whereas one shop mills alloy steel at 700 ft. a minute, another shop not far away is using 70 ft. And there is a reason. The first shop has its machines on the ground floor with good foundations. It also has negative rake carbide cutters and proper means of sharpening them. The other shop is on the second floor of a building, with much vibration and high-speed steel cutters. They hope to use carbide but are not sure of the effect of the vibration.

Another milling job is in an aluminum forging with a long, tapered cutter, that cannot be well supported on the outer end. In fact there is nothing rigid about the whole machine except the foundation. In spite of efforts to get good results, the work has been most discouraging. Speeds and feeds seemed too slow, although wide variations have been tried. To the surprise of all, slow speeds and slower feeds are giving better results and give promise of solving the problem in spite of our experience with very high speeds on aluminum. It is probable that vibration, caused by lack of rigidity in the machine, may be responsible. This should be remembered in trying speeds and feeds on unstable machines.

Large Electrodes Cut Welding Costs

WHEN Farwell Metal Fabricating Division changed to a larger electrode for arc welding gear covers on 5-in. gun mounts, welding time was cut 15 percent. Also, labor costs were reduced 15 percent in building the gun-mount platforms. The procedures used typify the progressive advance being made in arc welding methods to lower costs and increase war production.

The cover for the gun-mount elevating and training gear is made of 1/8 in. mild steel, and is welded with general-purpose Lincoln shielded arc electrodes, producing an air- and water-tight structure. The work was done originally by welding intermittently in a flat position, using 1/8-in. electrodes and a welding current of 90 to 95 amps. An increase in efficiency was effected by tilting the work at an angle of 45 deg. on a motor-operated positioning fixture, and welding downhand. At the same time, electrode size was increased to 5/32 in., and welding current raised to 150 amps. A final change was then made to attain the present 15 percent reduction in welding time by using 3/16-in. electrodes and increasing welding current to 180 amps. No change was made in welding technique.

The platform and guard rail for the 5-in. gun mount is constructed of 1/8-in. diamond plate flooring fitted with 3/8-in. ribs and 1/8-in. spacers. The parts are first clamped in position on a horizontal fixture for tack welding. The tacked platform is then removed and placed on a positioning fixture for tilting to a 45-deg. angle. Close tolerances are maintained by means of holding jigs. Downhand welding is employed at all times, using electrodes recommended for deep-groove welding on mild steel.

Electrodes of 3/32-in. diameter and suitable for welding poorly fitted parts were originally used on this particular job. Electrode size was then increased to 1/8 in., and still later to 5/32 in. The net result was a 15 percent saving in over-all labor cost.

Reduced costs resulted from increasing electrode size and welding current for fabricating this gun-mount platform. Similar savings were made by using larger electrodes for arc welding the gun-mount elevating gear cover

Sea-Going Vacuum Cleaner Makes Ship Salvage Possible

BY J. P. CALLAHAN

By a syphonic arrangement, steel is being salvaged from the sand-filled holds of the S.S. Port Hunter which, since World War I, has lain on the bottom of Hedge Fence Shoals, Vineyard Sound, under 100 ft. of water. There, between East Chop, Martha's Vineyard and Falmouth, Mass., the ship with its load of steel billets for 75-mm. shell, 100 knock-down freight cars and 800 sets of European-type railroad carwheels gathered drift sand to deck level.

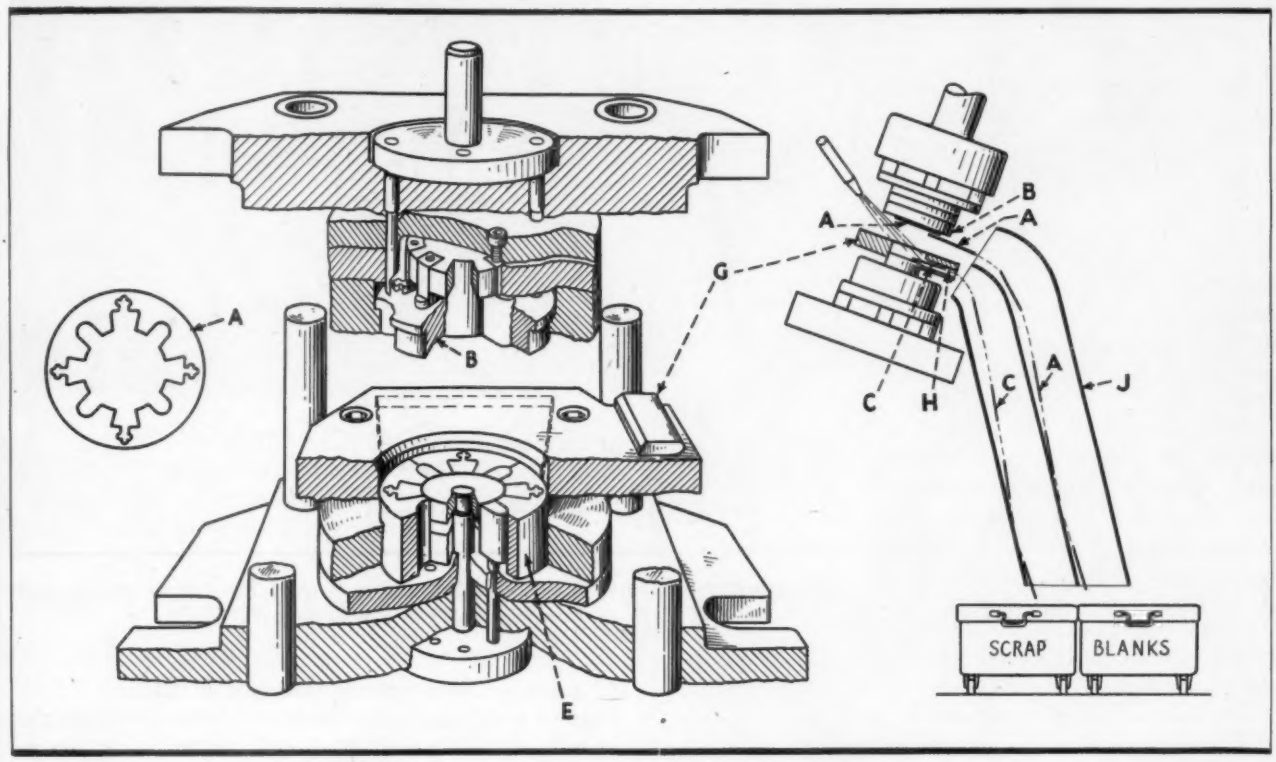
The major salvage problem was the removal of sand from the side and the holds. To accomplish this it was decided to use a special 12 in. steel tube, with an air line welded to its side. The tube extends above water and had an elbow and short nozzle pointed at all times to discharge with the ebbing tide. Air at 100 lb. per sq. in. pressure, introduced at the beginning of the 12 in. tube, creates a suction and pulls sand and stone into the tube. As the jet of air is sent up through the tube, bubbles rise and expand, pushing sand, mud and silt through the nozzle.

It is estimated that this syphonic arrangement removes 100 tons of sand per hour. The sand is discharged with the flow of the tide, and carried away far enough from the ship to permit no further interference with salvage work.

Given the proper conditions and weather, a job of this kind may take as few as ten days. Once the steel is removed by divers and surface workers, other experts will examine the hull to see whether the ship can be raised or otherwise salvaged for scrap steel.

Practical Ideas

★ **War-Winning Suggestions appearing on these pages were selected from those recognized as meretorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production** ★



This die retains the advantages of a compound die for punching thin metal parts, but eliminates ejection troubles. Punchings and scrap are segregated automatically

Compound Die for Sheet-Steel Punchings

BY E. H. GIRARDOT
General Electric Company

Sheet steel punchings present an interesting problem in press tools, particularly when delicate contour and extreme accuracy is required. For example, punching *A* made of 0.019 in. sheet steel had to be flat, free of burrs, and reversible at any position within a tolerance of 0.003 in.

Two methods of producing the part have been used, the first required three operations: compound blank, pierce slots and flatten. Due to extremely high production, the piercing die was designed without angular clearance in the slots and a positive lifting device was utilized to raise the scrap slugs to the top of the die where they were removed by an air blast. In this manner, maximum die life was assured with minimum burr, since the clearance does not increase as the die is ground.

The second method involved but one operation, using a compound die equipped with spring pads which pressed the blank back into the strip to be carried to another stage where it was dropped through the bolster. The scrap from the center and slots was carried up in the top die and removed by a positive knockout and an air blast in the conventional manner. Economical runs were experienced with the compound die, except that occasional blanks would not remain in the strip and be carried to the ejecting stage, due to two factors. First, the blanks were too thin to secure a positive grip in the strip and, second, a slight expansion in the strip was experienced, resulting in a looseness between the punched blank and the strip.

The die shown in the drawing was then designed to maintain the advantages of the compound die and at the same time eliminate the ejection troubles encountered. The essential construction of the compound die was utilized with the exception that the die was inverted so that the finished punching *A* would be retained by upper member *B* and be ejected by means of the positive knockout. The scrap center and slugs *C* are raised to the top surface of lower member *E* by means of a positive lifting device operated by a lift cam installed on the press. Stripper *G* was made with square hole *H* extending toward the back

of the press, so that scrap is blown through it and clear of the die. Partitioned chute *J* keeps the finished blanks and the scrap separated and drops them into their proper bins at the rear of the press.

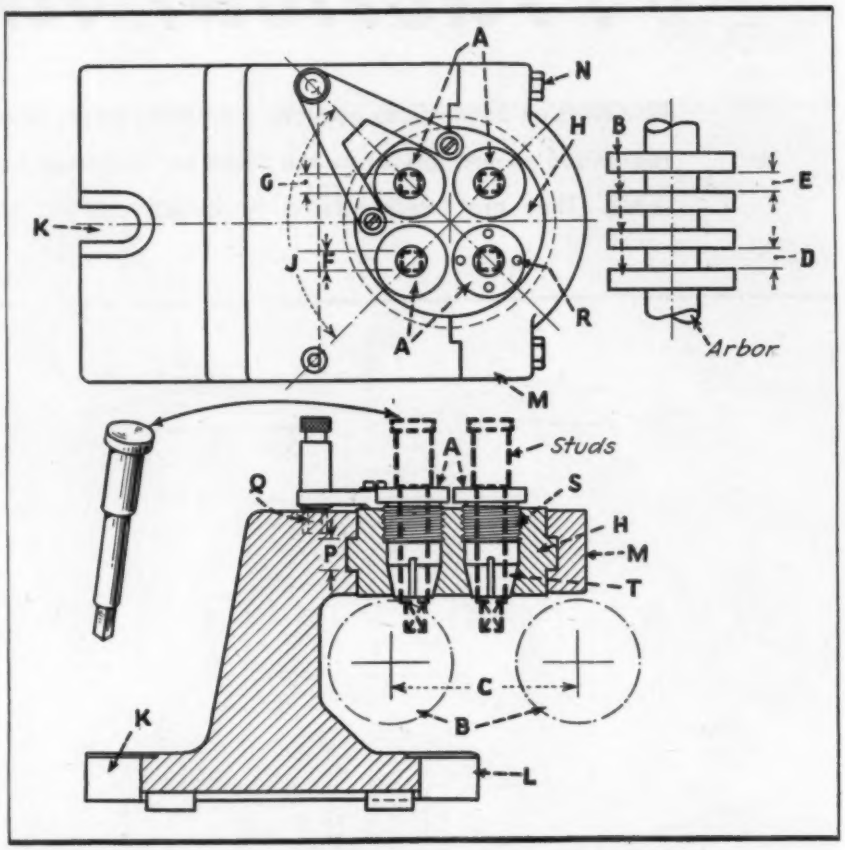
Fixture Indexes Round Stock For Milling Squares

BY FRANK HARTLEY

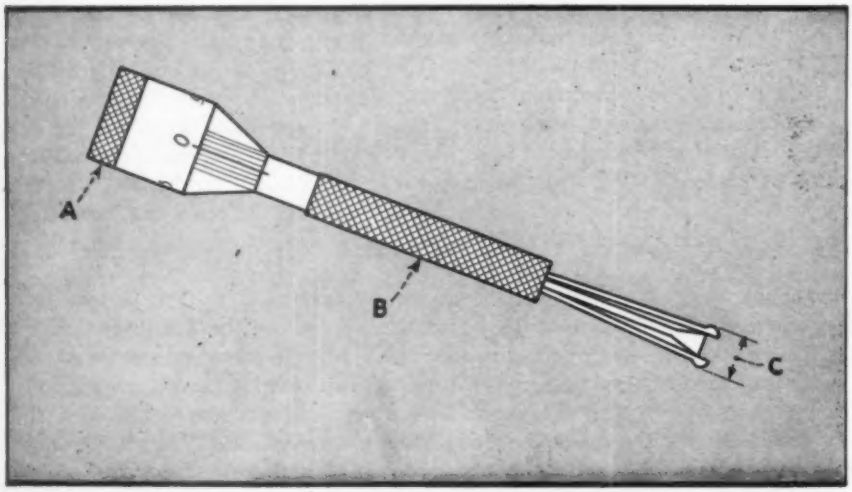
When we received a large order for the studs shown in the drawing, we designed the illustrated indexing fixture to hold four studs at a time for milling the square ends. Each stud is gripped in one of four chucks *A* mounted in a rotatable member held in a base so that cutters *B* can be traversed distance *C*. Two passes of the cutters are necessary to complete the milling of the squares on the four studs.

Two pairs of straddle milling cutters *B* are employed for this operation. One pair is set to dimension *D* and the other pair to dimension *E* for milling flats of widths *F* and *G*, respectively. Rotatable member *H* is then indexed through 90 deg. as indicated by arrow *J*, after which the cutters are again passed across the studs to complete the milling of the square end sections.

The base of the fixture is slotted at *K* and *L* for bolting to the milling machine table. Cap *M*, held in place by screws *N*, retains rotatable member *H*, which is aligned to the base and cap by a tongue and groove of width *P*. Index pin *Q* locates member *H* at each end of arc *J*. Chucks *A* are of spring-jaw construction. A spanner wrench that fits holes *R* in threaded sleeve *S* is used to tighten tapered collet *T* on the studs. The shoulder on the stud rests on the face of the chuck and serves as a means of location.



This indexing fixture with spring-collet chucks is used for milling square ends on four studs in one set-up



When the legs of this gage are set to the diameter of a hole, the thimble reading is noted. After the legs are contracted and the gage withdrawn, the legs can be reset accurately and the setting measured with a micrometer

Small-Hole Gage Has Micrometer Thimble

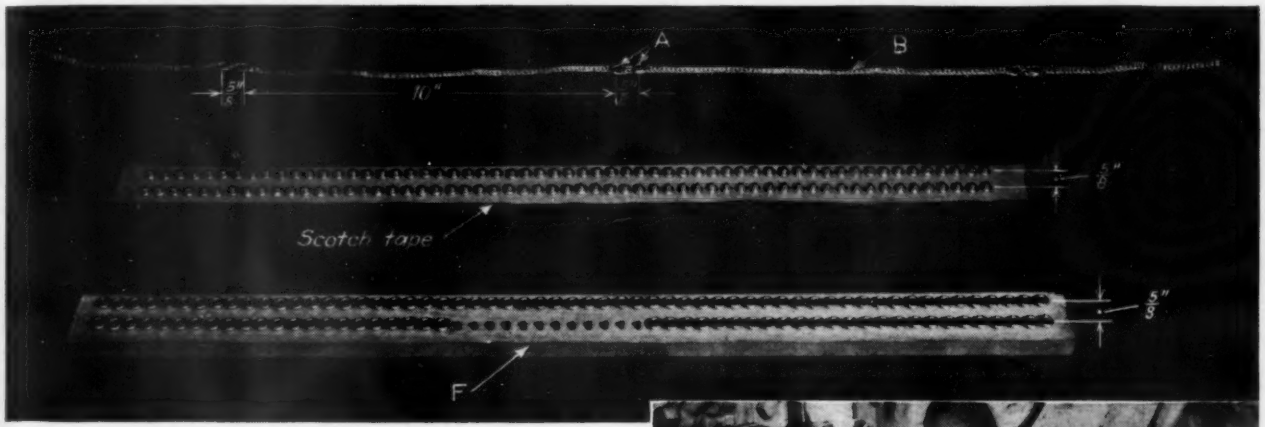
BY F. W. FROMM

We recently had considerable trouble on some aircraft subassemblies which had oversize attaching holes. This error was not discovered until a good many parts were already on the assembly line. The holes were through a spacer block 5/16 in. thick and then through the edge of the subassembly itself, which was ¼ in. thick.

The blocks had been drilled previously to installing on the assembly; consequently, in a good many cases, the hole was larger half-way through than it was at either end. This was determined by using small-hole gage.

However, it was impossible to determine whether the hole was over the maximum tolerance at the largest point, because after expanding the small-hole gage it could not be removed to measure it. Therefore, inspectors insisted that all the blocks be removed and checked.

In order to avoid all this work, I made a graduated thimble *A* similar to that on a micrometer and pressed it on the adjusting screw of small-hole gage. This made it possible to expand the gage to the largest diameter of the hole, note the reading on thimble *A*, and then back it off for removal. The gage was then returned to the former thimble reading, after which dimension *C* was measured with a micrometer. The gage will always return to within 0.0005 o 0.001 in. of its former setting.



Punch press tools are used here to pierce braided copper wire and crimp two gromets in holes spaced 5/8 in. apart. The gromets are set in pairs on scotch tape to facilitate the press feeding operation

Press Tools Set Gromets in Braided Wire

BY WILLIAM O. JENSEN

We had a problem of inserting two No. 1 telescoping gromets *A* on the ends of No. 10 braided copper cable *B*, which is 1/4 in. wide and 10 long. It was apparent that it would be necessary to insert and crimp the gromets in a punch press before cutting the wire to length, the cut being made midway between gromets *A*, which are set in pairs and spaced 5/8 in. apart. Since there were only 6,000 parts to make, the amount of money to be expended on tools was limited. The job was done economically in the following manner.

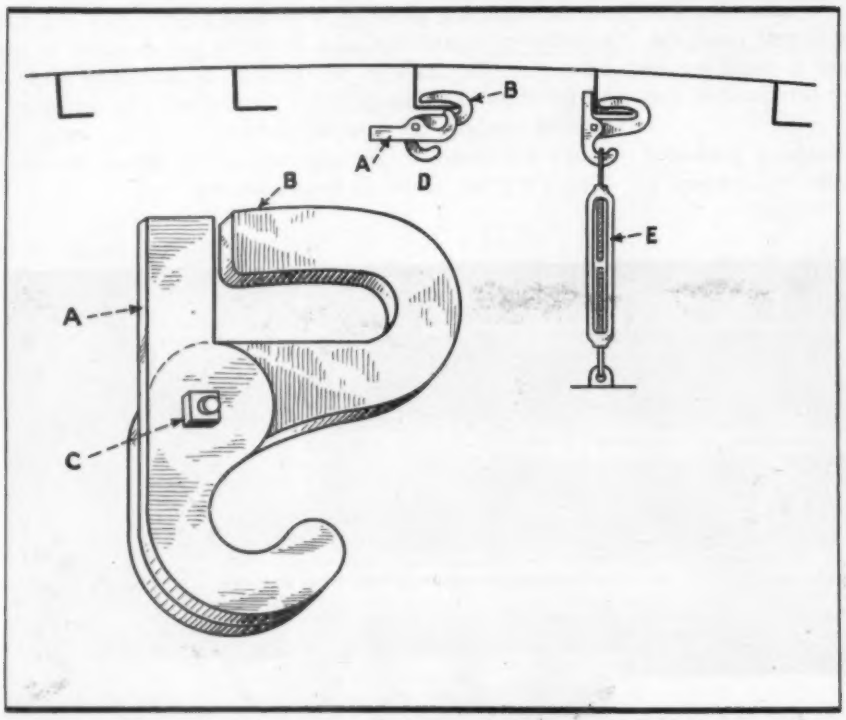
Piercing and crimping die *C* was designed with two piercing punches and two crimping punches. The space between the two piercing punches, as well as the crimping punches, was 5/8 in. to conform to the required spacing of the pairs of gromets. Die plate *D* was made with two slots. The braided wire was placed in the rear slot for punching and moved to the front slot where the gromet was inserted and crimped. Locating pin *E* at the end of die plate *D* is 10 in. from the right-hand punches and determines the spacing of the gromets. As the wire is fed through the press it is wound on a spool.

To facilitate feeding the gromets to the punched wire, two rows of pins, spaced 5/8 in. apart and with each pair of pins accurately in line, were placed in wooden board *F*. The gromets were assembled to the board with their heads up, and then transferred to a strip of scotch tape.

The punch press operator starts the job by inserting a single gromet at the beginning of a new reel of braided wire. He places the gromet over locating pin *E*, places the wire in the rear die-plate slot and pierces two holes. He then places the wire in the front die-plate slot, advances the scotch tape and raises it to insert the two crimping punches in a pair of gromets, and depresses a foot lever to lower the ram and crimp the gromets.

After a reel of wire has been fitted with gromets, it is taken to a bench where it is cut into 10 in. lengths. However, the short length of wire between the pairs of gromets is first soldered to keep the ends from fraying. The solder also flows around the gromets and makes them doubly secure.

The soldering operation was performed with a foot-operated device with plier movement jaws. The solder was fed from an overhead spool through a hole in the top jaw of the soldering tool, the solder being advanced a predetermined length each time the tool was operated. During the soldering operation, the braided wire was fed horizontally in front of the operator who reeled it manually from one spool to another.



The two parts of this clamp, pivot about a bolt, and when set over a beam the hook ends of each part align. Applied load keeps it from slipping

Beam Clamp Is Self-Locking

BY J. W. ROBINSON
Marinship Corporation

The self-locking beam clamp shown in the drawing can be used by riggers and maintenance crews in many shops, although it was originally designed for ship riggers. Its use has eliminated the practice of welding clips to angles and channels for the attachment of shackles, "come alongs" and chain falls. On one job where 100 such clips were employed, 18 hours were required to weld and remove the clips, and chip the weld. On a similar job, the illustrated clamps were replaced and removed in two hours.

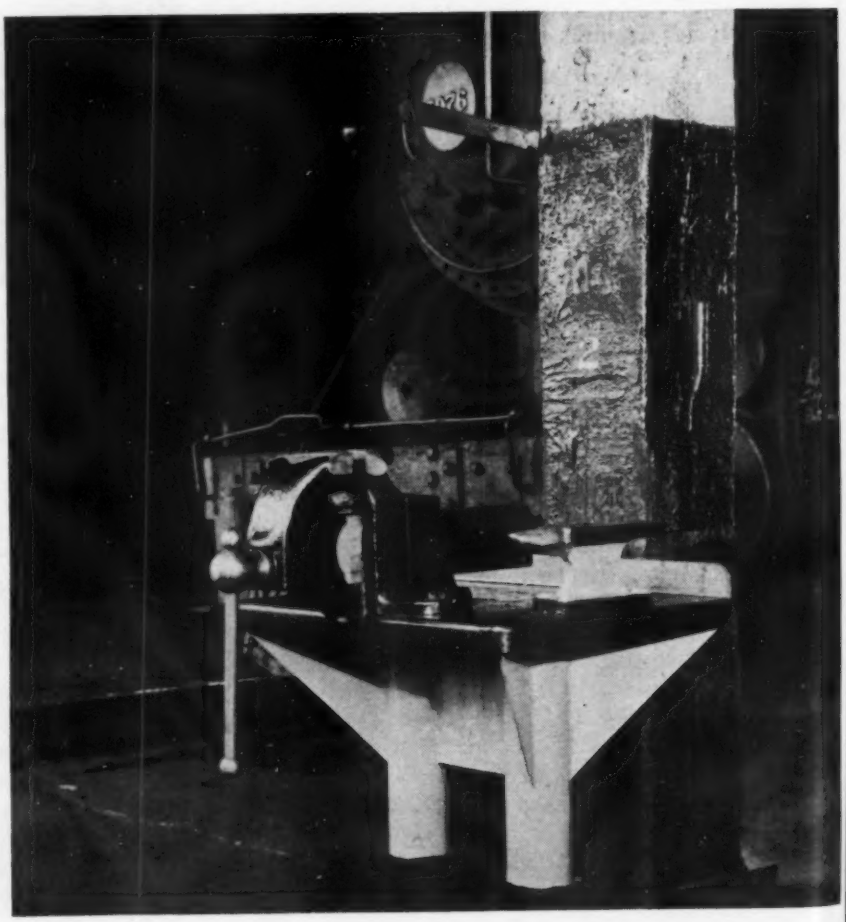
The clamp, consisting of parts *A* and *B* that swivel about bolt *C* is self-locking. It is slipped over a beam or channel as shown at *D*, and when load is applied through turnbuckle *E* in this case, part *A* of the clamp is held securely against one side of the beam. *War Winning Suggestion from the Board for Individual Award, War Production Drive.*

B. & O. Designs New Enginehouse Vise Bench

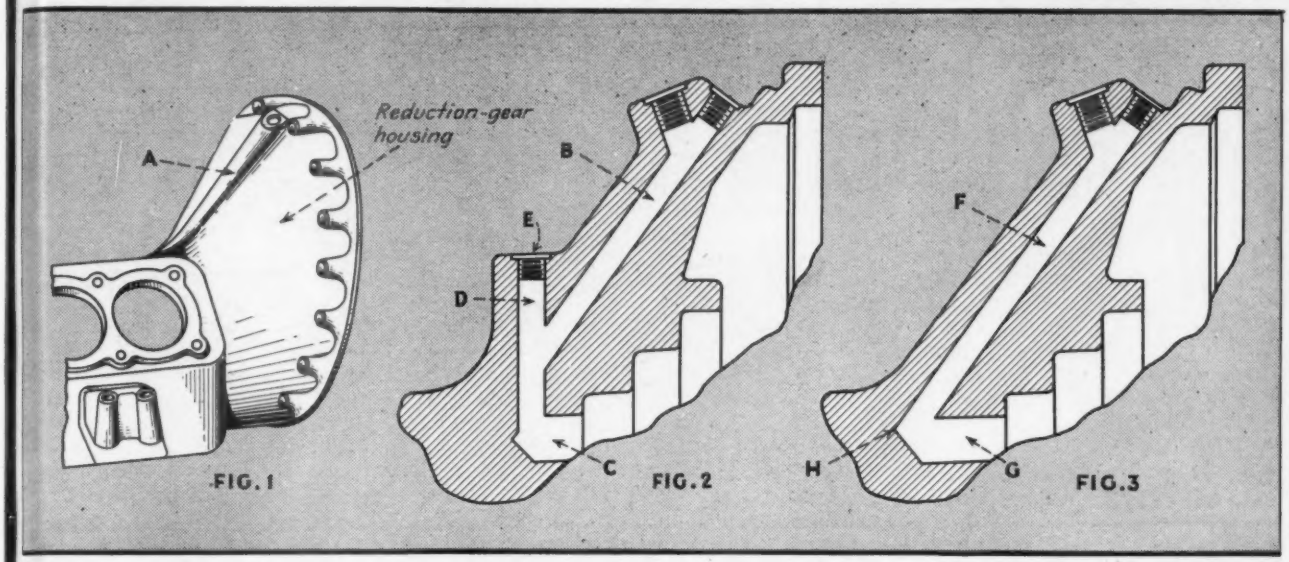
BY L. W. SAGLE

Following a suggestion made by A. J. Seward, boilermaker, the Baltimore & Ohio Railroad has adopted the illustrated vise bench for use in all its enginehouses. It is made entirely from scrap material. The legs are cut to length from scrap superheater tubes, while the top and gusset braces are made fom croppings and shearings that remain after fabricating various locomotive and tender parts. The bench top is flanged, and sharp edges are ground off the gusset plates. The entire assembly is fabricated by arc welding.

A vise and small anvil are bolted to the table, the addition of an anvil being an innovation that eliminates the practice of hammering on the shank of the vise. The legs of this bench are embedded in concrete, making a stronger structure than the table used previously, which was fastened to posts with angle braces.



This enginehouse vise bench, adopted as standard by the Baltimore & Ohio Railroad, is made entirely of scrap tubes and boiler plate



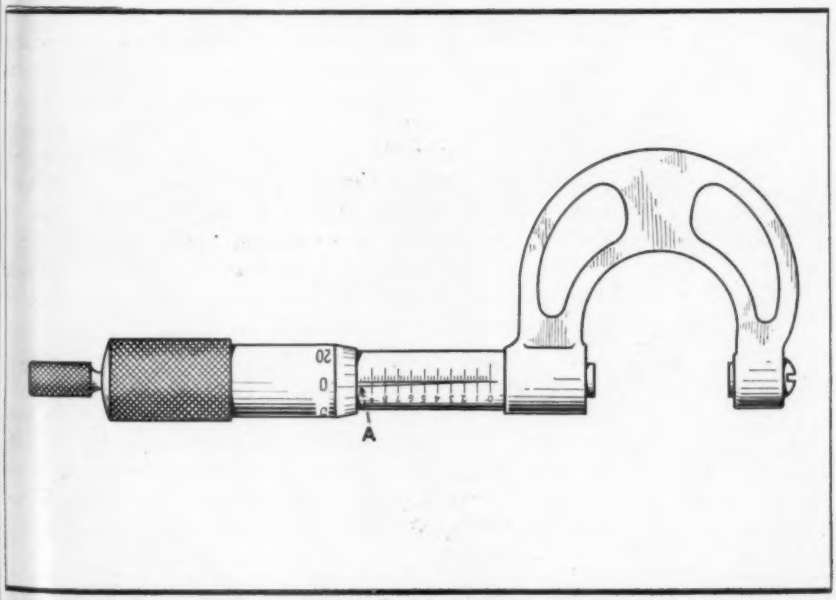
Changes in this Rolls-Royce crankcase reduction-gear housing eliminated the drilling, reaming, tapping and plugging of one oil hole and saved 15,000 man-hours annually

Redesigned Casting Simplifies Drilling Oil Holes

BY EDWARD CHAPAITIS
Packard Motor Car Company

The crankcase reduction-gear housing of the Rolls-Royce engine, shown in Fig. 1, is cast with an elongated boss *A* which when drilled functions as a high-pressure oil line. Fig. 2 shows the case as originally designed and processed by the Rolls-Royce Company. Diagonal hole *B* and horizontal hole *C* were drilled sufficiently deep so as to be intersected by hole *D*. Surface *E* was then faced and hole *D* after drilling was reamed, tapped and plugged.

It was suggested that the casting be redesigned as shown in Fig. 3 so holes *F* and *G* could be drilled to intersect at *H*. The suggestion was adopted after all manufacturers of the engine agreed to change the casting design, this being necessary to keep all engine parts interchangeable. As far as the oil line is concerned, the new design functions just as well as the old, while the drilling, reaming, tapping and plugging of hole *D* has been eliminated. This saves 15,000 man-hours annually at the present production rate. In addition, the casing has been simplified and strengthened, and oil leaks which previously resulted from the 70 to 90 lb. pressure carried by the line have been eliminated. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

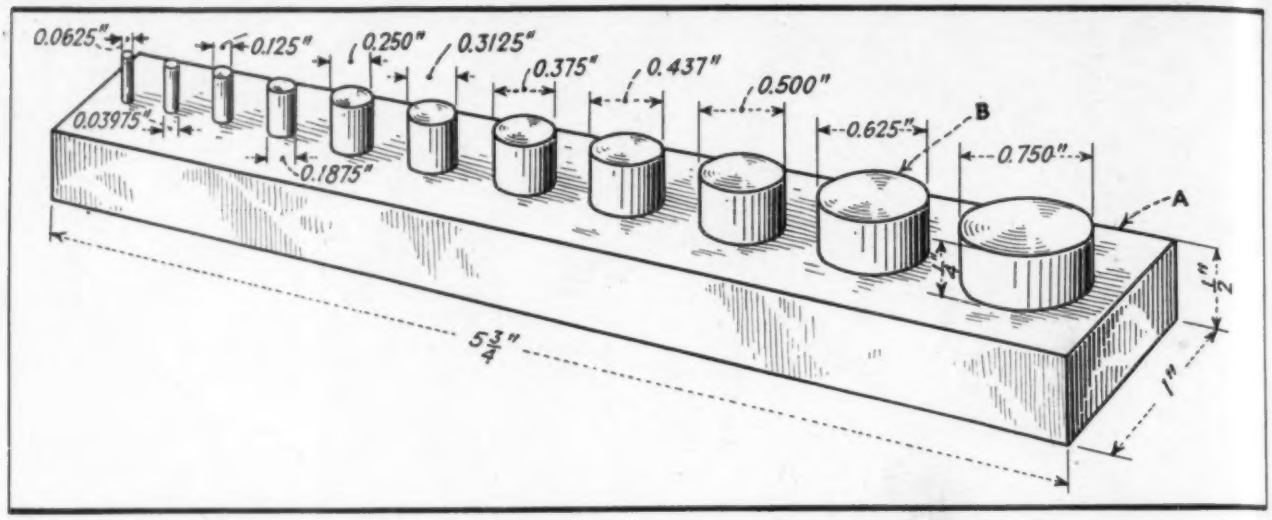


Although a micrometer is set accurately on zero, it may be out at its maximum reading. A line drawn between correct zero and maximum settings, serves as a new index and gives correct readings at any setting of the spindle

Micrometer Readings Corrected By Second Index Line

BY C. O. HOLMQUIST

After setting my 1 in. micrometer accurately on zero with the spindle and anvil in contact, I found that it was out 0.002 in. when checked with a 1 in. gage block. Rather than estimate the error of settings between zero and 1 in., I set the micrometer to the 1 in. gage block and, after clamping the micrometer frame to a surface plate, scribed line *A* between zero on the barrel and zero on the thimble, using a surface gage. Then I filled this line with red paint, using a fine camel hair brush. After the paint dried, the barrel was polished with fine emery paper. Line *A* is then used as the index when reading the micrometer, giving a correct reading of any setting between zero and 1 in. Line *A* can be scribed on larger micrometers.



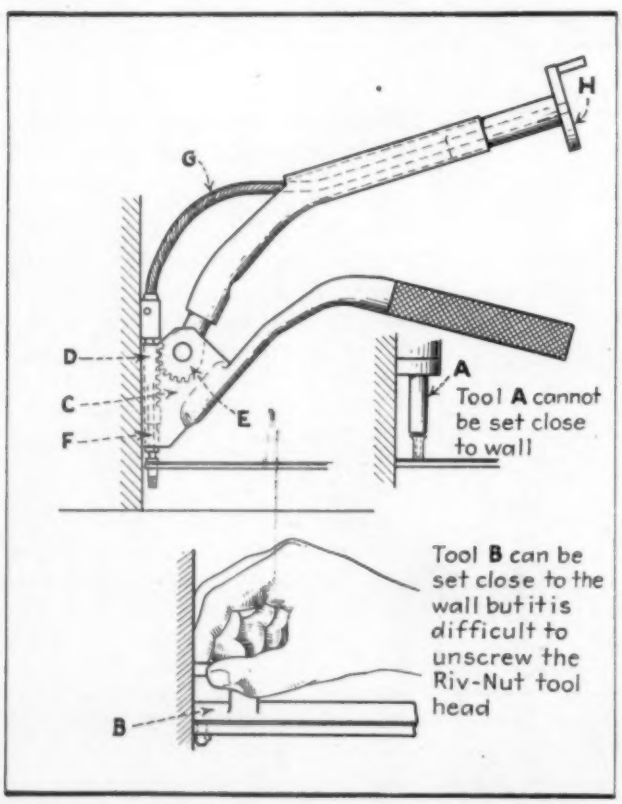
Drill rod of exact diameters are fitted in this block to make an assembly that serves as plug and hole gages. Kept in the toolbox, it saves going to the toolroom for the shop gages

Plug Gages Made From Drill Rod

BY VERNE M. LOOMIS

The plug and hole gages shown in the drawing have saved many steps and much time during the years I have had them. Block *A* fits a drawer in my toolbox, and since the gages are always handy I do not have to secure the ones kept in the toolroom.

Gages *B* were made over a short period of time. Whenever a bar of drill rod was received that was to size, a piece ¾ in. long was laid aside until the set was completed. Then Block *A*, made of ½ x 1 x 5¾ in. cold-rolled steel was laid out and the holes drilled 1/64 in. less than the diameter of the drill rod sizes. The holes were machine reamed and finally sized with an expanding reamer for a sliding fit of the drill-rod plugs. Since block *A* is ½ in. thick, the drill rod gages extend ¼ in. above it, making it easy to grip and remove them. The depth of the holes in block *A* is sufficient for determining the fit of any pin tried there.



Tool Drives Riv-Nuts in Close Quarters

BY J. L. VAN ARSDALE AND W. GALLOWAY
Murray Corporation of America

When there is not enough room for driving standard rivets during assembly of aircraft parts, Riv-Nuts can be employed. The Riv-Nuts are often set as close as ⅛ in. from a vertical wall, in which case tools *A* and *B* cannot be used to remove the screw after driving the rivet for the reasons shown in the drawing. However, tool *C* will remove the screw. It consists of rack *D* and pinion *E* mounted in a 45-deg. squeezer, and applies torque to the Riv-Nut screw at an angle of 90 deg. Spindle *F* is shaped to fit the head of the Riv-Nut screw, and is rotated by flexible shaft *G* when handle *H* is turned.

The elimination of bevel gears, with consequent reduction in the size of the head as compared to other type tools, permits its use in tight corners and close to obstructions. Riv-Nuts can now be inserted at the rate of five per minute as compared with two per minute with other tools, saving 2,700 man-hours per year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

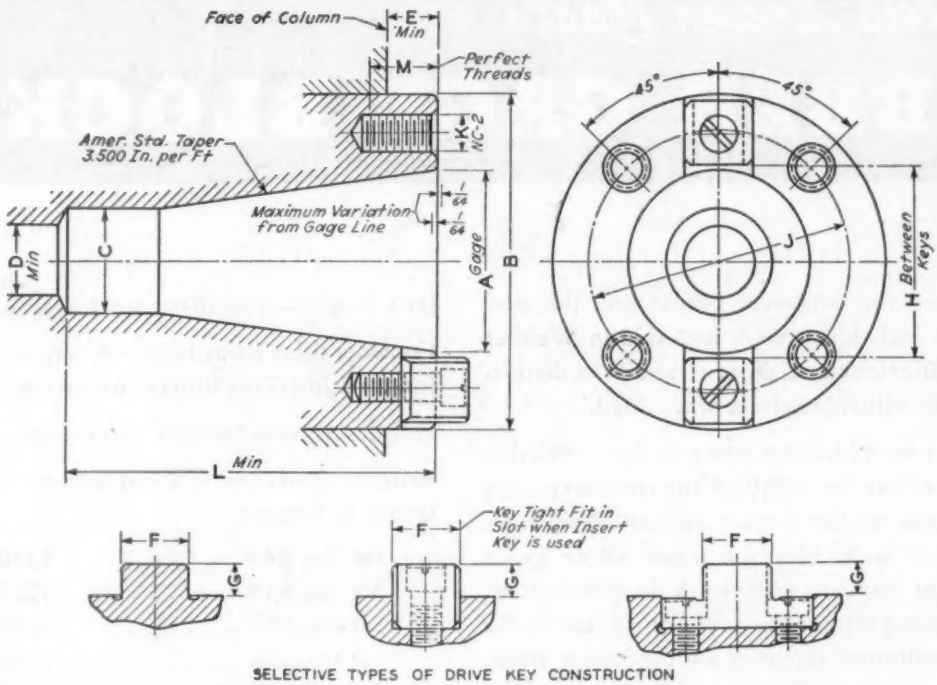
Screws can be removed from Riv-Nuts set ⅛ in. from a vertical wall with the aid of this tool. The tool head is operated by a rack and pinion, and the spindle is turned by a flexible shaft

AMERICAN MACHINIST REFERENCE BOOK SHEET

Spindle Noses and Arbors for Milling Machines—I

Sponsoring organizations for this standard are the American Society of Mechanical Engineers, The National Machine Tool Builders Association, and the Society of Automotive Engineers.

THE STANDARDIZATION of spindle noses and collets was one of the first projects to be undertaken by the Sectional Committee on the Standardization of Small Tools and Machine Tool Elements, B5, established by the A.S.M.E. in 1922. Prior to organization of a technical committee, the N.M.T.B.A., through the milling machine manufacturers' group, had released in 1927 a report on standard designs and dimensions of the spindle, the spindle-end and the corresponding arbors of a line of medium and heavy milling machines. These standards were completely new designs, in that the self-holding taper was abandoned in favor of a new self-releasing taper held by a draw-in bolt, a new tongue or key method of drive on the spindle-end was designed, and a new simplified set of arbors was included. The patents on these designs were later dedicated to the public, and following approval by the sponsor bodies, the recommendations were designated as an American standard in 1943.



SELECTIVE TYPES OF DRIVE KEY CONSTRUCTION

Table 1 Essential Dimensions of Spindle Nose

Size Number	Gage Diameter of Taper A	Diameter of Spindle Flange B	Pilot Diameter C	Clearance Hole for Draw-In Bolt, Min D	Minimum Dimension Spindle End to Column E	Width of Driving Key F	Height of Driving Key G	Distance Between Driving Keys H	Diameter of Bolt Hole Circle J	Size of Threads for Bolt Holes K	Full Depth of Arbor Hole in Spindle, Min L	Depth of Perfect Thread for Bolt Hole M
30	1 1/4	2.7493 2.7488	0.692 0.685	21/32	1/2	0.6255 0.6252	5/16	1.315 1.285	2.130 2.120	3/8–16	2 7/8	5/8
40	1 3/4	3.4993 3.4988	1.005 0.997	21/32	5/8	0.6255 0.6252	5/16	1.819 1.807	2.630 2.620	1/2–13	3 7/8	13/16
50	2 3/4	5.0618 5.0613	1.568 1.559	1 1/16	3/4	1.0006 1.0002	1/2	2.819 2.807	4.005 3.995	5/8–11	5 1/2	1
60	4 1/4	8.7180 8.7175	2.381 2.371	1 3/8	1 1/2	1.000 0.999	1/2	4.819 4.807	7.005 6.995	3/4–10	8 5/8	1 1/4

All dimensions are given in inches.

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Thus with a Webber No. 84-A Set of Gage Blocks you not only get more for your money —but a set with far greater utility—one that lasts longer—a set that costs less to maintain.

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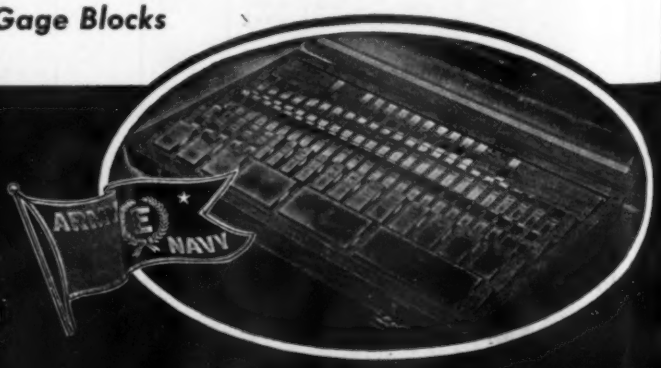

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GAGE COMPANY

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Spindle Noses and Arbors for Milling Machines—II

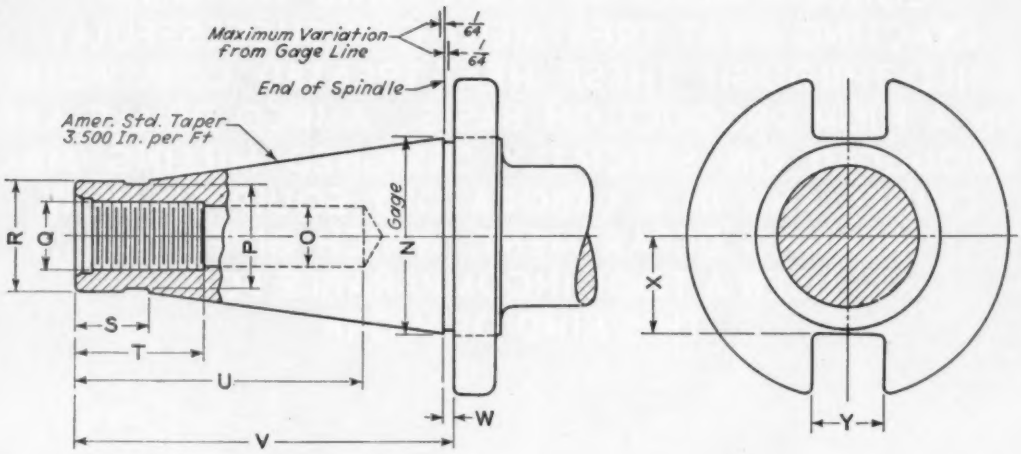

Table 2 Essential Dimensions for Ends of Arbor and Adapter

Size Number	Gage Diameter of Taper N	Drill Clearance for Draw-In Bolt O	Diameter of Neck P	Size of Thread for Draw-In Bolt Q	Pilot Diameter R	Length of Pilot S	Length of Perfect Threads T	Depth of Clearance Hole U	Distance from Rear of Flange to End of Arbor V	Clearance of Flange from Gage Diameter W	Depth of Driving Slot X	Width of Driving Slot Y
30	1 1/4	27/64	41/64	1/2–13	0.675 0.673	13/16	1	2	2 3/4	1/16	0.640 0.625	0.630 0.640
40	1 3/4	17/32	15/16	5/8–11	0.987 0.985	1	1 1/8	1 15/16	3 3/4	1/16	0.890 0.875	0.630 0.640
50	2 3/4	7/8	1 1/2	1–8	1.549 1.547	1	1 3/4	3 1/2	5 1/8	1/8	1.390 1.375	1.008 1.018
60	4 1/4	1 7/64	2 9/32	1 1/4– 7	2.361 2.359	1 3/4	2 1/4	4 1/4	8 5/16	1/8	2.400 2.390	1.008 1.018

All dimensions are given in inches.

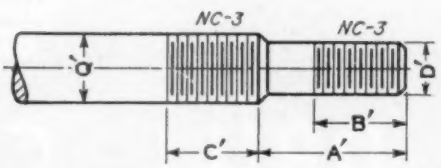

Table 3 Dimensions of Draw-In Bolt End

Size Number	Length of Small End A'	Length of Perfect Thread at Small End B'	Length of Perfect Thread on Large Diameter C'	Size of Thread for Large End Q'	Size of Thread for Small End D'
30	1 1/16	3/4	3/4	1/2–13	3/8–16
40	11/16	11/16	1 1/8	5/8–11	1/2–13
50	1 1/2	1 1/4	1 3/8	1–8	5/8–11
60	1 3/4	1 3/8	2	1 1/4–7	1–8

All dimensions are given in inches.

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DRILL THROUGH THESE HEAT-TREATED CON. RODS
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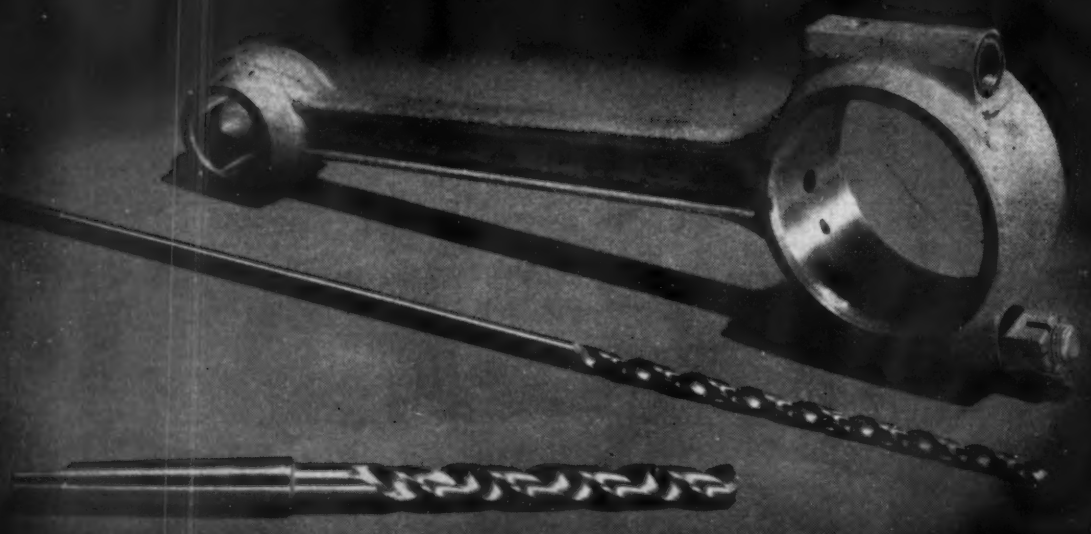

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A Sound Policy for Veterans

EVERYONE is rushing to do something these days for discharged service men.

Cities, states and federal agencies have their own programs. Organized labor is formulating plans. Industry wants to do its part.

The danger is that in the stampede to be helpful a dozen programs, uncoordinated with each other and overlapping to some extent, will be launched to the confusion of the public and of the veteran himself.

One of the encouraging signs that this danger may be avoided is the attitude of the administrator of the Veterans' Rehabilitation and Retraining Program.

He is not plunging headlong into a preconceived plan or one devised post-haste within a few weeks after his appointment.

He is first finding out what existing federal government agencies already are doing (well over one million men have been honorably discharged to date) and what the states and cities are doing.

After he has at hand all the facts, he will decide upon a policy that makes of all the activities a well-rounded program.

There are a few basic principles to which he intends to adhere, and they are sound to the core.

He believes that no veteran should be sent into an industry unless he has a reasonable chance of making good on the specific job offered him.

He believes that no badly disabled veteran should be thrown on his own in a job without having been trained and even then not unless he holds promise of filling it satisfactorily.

He is a firm believer in making available adequate schooling and training courses to the returning men and in such training being done on the job as well as in the high schools and colleges.

He is convinced that the greatest catastrophe that could overtake the country would be a hurried demobilization that would throw millions of service men into the labor market place before industry has the time to reconvert.

Whatever program is devised must be on a constructive basis and not on a "make-work" principle.

It seems to us that General Hines and American industry speak the same language. His approach is free from ballyhoo, is understanding and sympathetic, and is thoroughly practical.

Burnham Finney

Gaging Business

Draft Won't Cut Output

The decision no longer to defer most of the skilled men from 21 to 26 years old puts an added burden on the country's war industries and here and there may cause output to drop below the anticipated schedules. Continued deferment of key technical men will protect the high-octane gas and synthetic rubber programs. Those two industries are unusually dependent upon young men. Aircraft may suffer somewhat. War production on the whole, however, is going along smoothly and is expected to continue at current levels. Total war goods produced this year will be around $70,000,000,000; projected needs for fiscal 1944-1945 show no appreciable falling off.

Production Generally Okay

March will be the best month to date for aircraft manufacture. It is doubtful whether plane assemblies will go higher than the present peak. Within a month or two landing craft should climb to the planned high point and then level off onto a plateau. The production curve for certain kinds of communications equipment is still rising. Naval ordnance output will not get up to the ceiling for several months; the current rate is up to the anticipated volume. Shipbuilding is being maintained at the peak.

Bearings Tightest of Components

The situation in components is improving, but several extremely tight places are as yet unrelieved. Fractional horsepower motors probably is the worst spot of all. Manufacturers are booked months ahead. Bearings give promise of easing a bit, though the larger sizes are scarce. The bottleneck in bearings will be eliminated as soon as new capacity now being created can be put into production. The biggest pinch in bearings comes from the army's motor truck program. Tire cord is the only serious limiting factor in synthetic rubber operations, which have expanded substantially in recent weeks.

Withhold Civilian Production

The amount of resumption of civilian goods manufacture this year appears to be slim. Automobiles will not be made during 1944, unless a sudden ending of the European phase of the war should occur at a relatively early date, and that seems unlikely. The rapid wearing out of cars owned by war workers might precipitate late this year an order to make 200,000 cars or so as an emergency measure. There is a marked reluctance to permit any sizable new civilian goods program until after the continental invasion problems are solved. Moreover, the components needed for such civilian goods are those most critical in the war program. Hence availability of materials and of productive facilities doesn't count for much at the moment. Another point is involved—the armed services believe it desirable to create pools of unemployed labor at various localities, the theory being that unemployed men thus will be more willing to move to other areas where war plants still are badly short of labor. WPB is not in total agreement with this policy.

In a limited number of cases the urgency for certain civilian items has been so great that their manufacture has been authorized even in the tightest labor areas. This has been true in such items as electric irons, floor machines, commercial ice machinery and commercial baking equipment. Railroad locomotive and car builders are running at full tilt. Tractor production is about 23,000 units a month. The volume of farm equipment being turned out is 40 to 50 percent more than in the best peacetime year.

Sufficient Tools, Materials

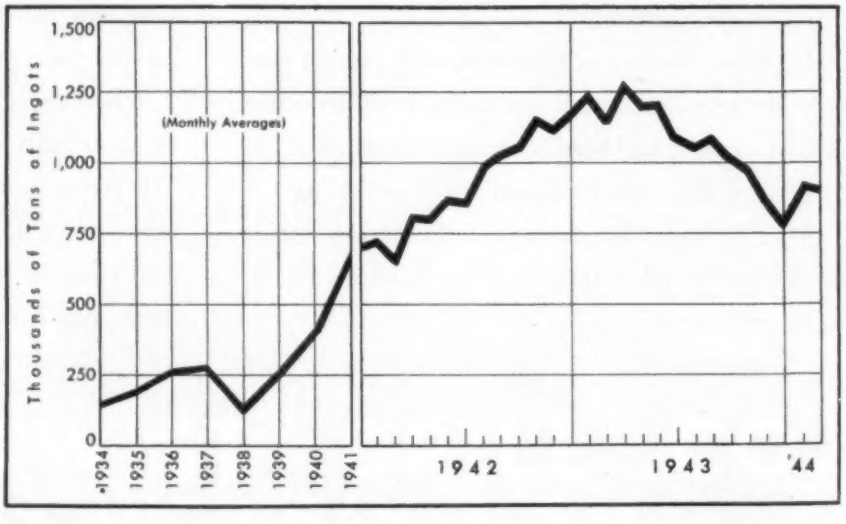
There is scarcely any raw material today that is not available in sufficient quantities to meet war requirements. For all practical purposes, materials with the exception of lumber no longer are a problem. Machine tool backlogs continue to sink as production remains considerably in excess of new orders. Chief new business consists of machine tools for the larger-size aircraft engines to be made by Buick, Chevrolet and Dodge-Chicago organizations. The number of new machine tools unassigned from pool orders totals about $32,000,000, or less than two percent of the pool orders placed during the entire war production program. Machine tool plants have been compelled to go to shorter hours and fewer shifts, except when they have succeeded in securing subcontracts for direct war items. The time seems to be getting farther away rather than nearer when Washington will permit automobile makers and other machine tool users to place orders in anticipation of retooling for manufacture of peacetime goods.

Survey Idle Machines

The Tools Division of WPB is completing a survey of the idle machines on hand in war plants around the country. War contractors are reluctant to declare any piece of equipment idle, and therefore subject to transfer elsewhere, unless they are sure that it will not be needed in the months ahead. Relatively little progress has been made in providing a sound, workable plan for disposing of surplus machine tools and plant equipment after the war.

Steel Seesaws

The steel supply-demand picture is flickering between shortage and sufficiencies. Some categories are tight and shortages occuring, as in the supply of plates and in some kinds of finished goods. Carbon steel is close to balance; by next week it may be either up or down.



Alloy Drop Continues—Steady decline in alloy steel production, since its year-ago peak, may be attributed to completion of installations in which it was required, cut backs of tanks and artillery, diversion of facilities back to production of carbon steel and recent decline of 42,000 in steel mill employment

Shell Boxes to Take More Steel Than Did Autos

Wood and paper scarcities lead Army to try all-metal case to ship ammunition, replacing combination fiber-wood and metal containers now used; latter none too satisfactory

WASHINGTON—The Army is embarking upon an experimental production of steel ammunition shipping cases which, if successful, will replace the fiber-case-plus-metal-cloverleaf-plus-wooden-crate arrangement now in use. Inaugurated as a wartime substitute, the latter has not proven entirely efficient and now, with paper and wood more difficult to procure than steel, has little to recommend it.

The production program now going on is a one-time procurement and is expected to be completed in August or September. Should the cases prove successful and be standardized, the program will probably continue right on from that time until complete conversion is attained. Until that point is reached, it is understood the program would require "a greater tonnage of steel than did the automobile industry in a lush year." After that, cases would be reused unless damaged, and procurement would taper off.

Won't Cause Joblessness

No dislocation of labor is anticipated, for a direct shift by producers from fiber case and wood crate output to that of steel cases is probable.

The new type cases will have the advantages of being water proof and able to stand much rougher handling than did the fiber and wood ones. The Japanese, knowing the conditions prevailing in the islands of the Pacific, have long used metal containers for fuzes. It has been pointed out that the metal shipping cases will be proof against the wide ranges of temperature to which the exigencies of war subject ammunition.

Considerable flexibility was placed in all parts of the specifications, both as to materials and means of production. This was done to facilitate the using up of "on-hand" stocks and to utilize various types of equipment.

Twenty-five production run samples from each producer are put through tough tests before acceptance.

After firing, empty projectile cases are replaced in the shipping containers for return to the United States. Here the projectile cases, after proper inspection, may be reloaded and sent again to the battle front, or melted down for scrap. Similarly, the shipping cases will be reused.

A program is on foot to find various raw materials in the fighting areas that may be advantageously poured into the shipping cases, with or without the projectile cases therein, for transportation to this country.

Need for Using Three-Way NE Alloy Steel Emphasized

WASHINGTON—WPB's Steel Division has warned steel producers that a relaxation in the use of three-way alloy National Emergency Steels has threatened the existing balance between supply and demand for chromium and nickel and it notified them that it is WPB's aim to insure that 60 percent of alloy steel production goes into three-way alloys.

The Steel Division and other agencies concerned will review all alloy steel melting schedules and substitute three-way alloys wherever possible for single and double-alloy grades.

The NE steels program, WPB explained, has relieved the imbalance which existed in alloy supply a year ago. Resulting relaxation in the use of NE steels is a cause of "serious concern," it said, with January losses in three-way alloy ingot production totaling one-quarter of all the gains in its use registered in 1943.

Not only is the present supply-demand balance predicated on savings possible only under the NE steels program, but "wholesale return" to the single and double alloy steels "would seriously threaten" carbon steel production through shortage and contamination of carbon scrap.

WLB LEAVES DOOR OPEN

WASHINGTON — The "Little Steel" formula for wage control survived a frontal attack upon it by the American Federation of Labor last week, but the War Labor Board, in repulsing a move to scrap it, left the door open for similar action hereafter.

Specifically, WLB rejected by 7-4 vote a motion by AFL's board member George Meany asking WLB to request that the President "modify realistically" that part of his executive order which constitutes the "Little Steel" formula as the line which must be held against inflation.

Labor members dissented in the vote on the resolution, and industry members dissented in voting upon a resolution that the rejection be without prejudice. This motion, by public member Lloyd K. Garrison, carried 8-4.

Nationwide Postwar Planners—Heading up the more than 1400 community CED committees now working with over 48,000 business employers in planning maximum postwar employment are: (at head of table) Paul G. Hoffman, president, Studebaker Corp. and chairman CED Board. At his left, T. O. Yntema, director of research. At his right, M. B. Folsom, treasurer, Eastman Kodak Co. and chairman of CED Field Development Division, and H. R. Johnston, assistant director of the division

School Days, Work Days—Teen-age girl students of San Diego schools' work-experience course attend classes four hours daily, after which they work for Consolidated Vultee Aircraft Corp., riveting Liberator bombers. Starting rate is 60¢ hourly, with a nickel raise weekly until they receive 75¢

Capital on Sidelines as Labor and Government Argue Steel Pay

NEW YORK—It has become incontrovertible that the question of whether there will shortly be general wage increases throughout American industry will be settled by a political decision.

The elaborately staged play-acting now going on in Washington and identified as the Steel Case hearings before the National War Labor Board —though of grimly serious importance to the participants—is almost entirely dream stuff. Reality reposes in the White House, and it is there that the opposing forces and influences will be weighed and analyzed. Whether the steel workers get a pay boost, how much it will be, and how soon it will be forthcoming will not be determined to any significant degree by the arguments, testimony, and exhibits being presented to NWLB by either the steelmasters or the CIO.

FDR Will Call the Dance

President Roosevelt, reading the political signs, will say whether the wage line—and with it the price level—is to be broken or held.

For it is elementary to note that "special circumstances," of the type that justified wage adjustments for coal miners and railroad employees cannot be found for steel. Any rate increase must necessarily modify the current wage increase limitation formula. And any rate increase for steel will make a new wage boost yardstick for all industry.

It is also unmistakably apparent that CIO's steel union will go the limit in cracking the wage line. The union will not strike to get its full 17¢ an hour pay increase demand, but, in spite of pledges to the contrary, it will not refrain from striking for a pay boost of some smaller dimension. One of the things which Roosevelt must decide is shall the wage line be held in the face of a walkout or in the face of threats which—like on the railroads—would necessitate a government takeover of the mills.

It's a tough decision for the President in an election year and it may well test his professed axiom that what's good for the war is good politics. One development, and one only, can ease the burden of his choice.

Invasion Will Solve It

That is, of course, the opening of a second front in Europe before the wage crisis enters its final stage. Nothing short of that will take the heat out of the CIO. Once the casualty lists start coming in from France a strike is a tactic which would evoke a savage public reaction and would be avoided at all costs by labor leadership.

Consequently it is to the Administration's interest to delay a decision in the steel case, to labor's interest to speed it. Employers, with just as great an interest in the final outcome, are actually on the sidelines as the unions and the government fight it out.

Armed Services, with Enough Materiel, to Take Key Workers

WASHINGTON—The worst pinch of the war is on in the manpower field and war producers who are not on work of the most critical nature can expect to lose key workers under the age of 26 even if it costs them production on direct war items.

So great is the need for young fighting men that not even the aircraft plants will be able to protect key workers under 26, it has become apparent in Washington. The current line-up has manufacturers producing high-octane gasoline, special radio equipment and a few other "secret" lines alone in the preferred position of being able to hold their young men. These are favored principally because the young men in these industries are so specially-trained that they cannot be replaced.

Materiel Plentiful, Men Scarce

Other industries, even though they are producing fighting equipment, stand to take severe losses among their young men regardless of effects on production. The services have reached a point at which they need young men more than they need virtually any item of equipment. WPB has been forced into the attitude that manufacturers will just have to produce without the men who have helped them build up to the present peak production levels.

Selective Service Director Lewis B. Hershey warned Draft Boards recently that draft calls have averaged 100,000 men short in each month since October 1. Although substantial numbers of fathers have been inducted, he warned, more must go, and, the cold mathematics of the manpower pool being what they are, the gap between needs and available men, in all but the occupationally deferred classes, must be filled by withdrawals from the ranks of the occupationally deferred.

Eye 2-A's and 2-B's

Hershey revealed that a 240,000-man deficit exists between the demand and the supply available without taking occupationally deferred men, and that the only hope for filling this gap lies in the 3,204,000 men in classes 2-A and 2-B, of whom 348,000 are non-fathers under 26 years of age.

Hershey reiterated a long-standing and widely-ignored tenet of selective service that occupational deferments are not normally to be regarded as continuing but are, except in rare cases, to be regarded solely as furnishing a period in which a replacement can be found and broken in.

The decision to sacrifice war production to muster every available fighting man was handed the steel industry recently at a conference in Washington between industry leaders and top WPB men.

Inside Detroit

BY SILER FREEMAN

To Confer on Conversion

Probably the most frequent question heard today is "When will we have new passenger cars again?"

This question may be nearer an answer after next month. Sometime in April, a delegation of top executives from the automotive industry will head to Washington. They, as the automotive industry advisory committee, will confer with Donald M. Nelson, War Production Board, as a preliminary step to the eventual resumption of car production.

Although only one of many industry meetings which WPB has scheduled looking for easier transition from war to peace economy, it will nevertheless be the most important. The industry is encouraged by the formation of the advisory committee, not because it feels that its but a short step from actual allocation of materials and the flashing of the green signal, but because it is the first public intimation that WPB recognizes a possible chance to let them do outright planning for the reconversion period.

Until the announcement of the industry advisory committee, every effort to get official recognition from the WPB of the possibility of making cars with the war still on was met with rebuffs. Now it looks like Nelson and the automotive officials may work out a tentative plan which could be put into effect on short notice. It would give the industry an idea of what the WPB is thinking and for that matter, what official Washington is thinking, about their problems.

Worry Over Quota

Car manufacturers are withholding an over-optimism on what may come out of the meeting or even what forward-looking plans they will be permitted to make on an industry-wide basis. For one thing, the auto makers want to know just what percentage of their normal production they will be permitted to manufacture, if and when they get back into stride.

George T. Christopher, president of Packard, has expressed great concern about this factor. With rising costs of material and labor already shooting the future price-tags up from 22 to 25 percent, the number of cars each manufacturer will be allowed to turn out becomes important.

Say Thirty Percent Needed

Christopher believes that this must be a minimum of 30 percent of the normal output allowed or the manufacturers cannot even enter into production. This means, about 1,750,000 cars for interim output.

Should the WPB okay less than that, Christopher believes the car makers will not even want to attempt it. On a small scale production, he points out, costs would rise so prohibitively that the companies, while anxious to get back into normal business, could not afford it.

"It would kill the market," Christopher told the writer recently. "The per unit cost would be too much and I doubt if any manufacturer would want to undertake it on that basis. Below a certain point, which I estimate at about 30 percent of the 5,000,000 car year, it would be bad for the manufacturer and the public."

Inherits Hot Spot

Detroit's regional WPB office has a new director. He is Carsten Tiedeman, who was vice president and general credit manager of Universal Credit. Tiedeman took over the job held by Ernest C. Kanzler and D. J. Hutchins but with a fairly smooth-running organization built up by them.

With the talk of reconversion planning in the air, Tiedeman may have stepped into a hot spot. But he promises to pitch in and work it out. He is a youngish, athletic type with a pleasing personality and has been devoting his first days as WPB chief here to visiting plants to get an insight into their problems.

Press Cooperation Invited

The revived Army Air Force tool sale scandal has prompted Col. Alfred Johnson, head of the Central Air Procurement District, to adopt a franker attitude with the press and writers. He recently invited the editors and publishers in Detroit to be his guests on an all-day tour of CPD's new headquarters on Lonyo road, around the corner from its former offices in the Graham-Paige building.

The tour took the editors and writers through the various divisions of CPD and gave them an insight into the huge operations that emanate from the executive departments. It wound up with a tour of the huge warehouse where millions of dollars in tools are still stored.

But changes have been made in the system, the CPD officers casually pointed out. There will be no repetition of the ill-advised move which caused such a furore in Detroit and Washington.

Labor Has Internal Troubles

Labor troubles have eased off in Willow Run but are now finding an outlet in the River Rouge plant of Ford. Stoppages have been frequent this month and has brought down the wrath of the union heads on the radical leaders who have been causing the stoppages without authorization. The most recent outbreak, March 13 and 14, caused the dismissal of 50 workers at the Rouge plant, with the approval of the union.

Meanwhile, however, many hundreds of man-hours have been lost from the production of the vital Pratt & Whitney engine and engine parts.

The Ranks Swell

The passing parade of veteran Ford executives continue to grow. Latest is H. C. Doss, who was sales manager since 1939. Several months ago Doss was demoted to regional sales manager for the southeast region.

Now comes the announcement from Henry Ford II that Doss has resigned from the Ford organization. He thus joins the illustrious ranks of Messrs. Sorensen, Wibel, Shelldrick, Boyer, et al.

Women's Work—At the Toledo transmission plant, Chevrolet Motor Div., General Motors, this woman operates a vertical dual-ram surface broaching machine, broaching the front face complete of the universal joint flange for military vehicles. Since each of the two broaches is 60 in. long, she stands on a platform to feed the work.

School Tools Replacement Would Take Three Million of Surplus

WASHINGTON—The replacement of vocational school machine tools, which have become obsolete or been worn out during operation of the War Production Training Program, would absorb $200,000,000 of the postwar surplus. Similar replacement of small tools would take another $100,000,000 of the surplus. Such is the estimate of Major S. M. Ransopher, assistant director of equipment, space and priorities, U. S. Office of Education.

Through subsidizing 2,600 war training centers and paying the pertinent portion of the teachings of 3,800 trade and vocational schools throughout the United States, the War Production Training Program of the Office of Education has graduated 6,000,000 trainees in a 30-month period.

Each training center was usually fully equipped with new tools. The schools used their existing equipment or had additional machines furnished by the Office of Education. About $45,000,000 of tools and equipment was purchased for this program; of this, the bulk was machine tools.

Training courses are divided into pre-employment, for new employees or for those preparing for upgrading, and supplementary, for those who seek to better their understanding of the jobs they hold.

Courses are set up, in training centers or vocational schools, on the basis of the U. S. Employment Service demand for manpower. Should demand rise past the potential of the industrial community, training would be extended farther and farther afield to outlying population centers.

NYA Tools Distributed

Of the approximately 8,000 machines the now-defunct National Youth Administration had to carry on its program, roughly 25 percent were loaned to school machine shops. This was done with the understanding that they would be returned to the Treasury Procurement Division within six months after the end of the war. Informed opinion is that Congressional action will offer these machines to the schools at a few cents on the dollar of original cost.

Other government agencies took the balance of the machines, with the exception of a few scattered ones which are still in storage and considered unusable. Machines taken by other government agencies were bought outright by them. In some instances, these agencies have completed their use of the machines and have transferred, or sold them in accordance with prevailing procedure.

First Government Backed Sale Staged for Air Plant Surplus

NEW YORK—Samples of items of excess inventories of large East Coast aircraft manufacturers went on sales display this week at the McAlpin Hotel. The exhibition, in which the aircraft companies have joined voluntarily, is being conducted under the auspices of the New York Regional Office of the War Production Board. It will continue through April 8.

Included are more than 5,000 different types of items, covering aluminum, steel, copper, hardware, perishable tools, miscellaneous industrial supplies and materials, and component parts.

The diversion of these products into trade channels through sales to be consummated is expected to aid in replenishing stocks in many industrial fields, including both war and essential civilian production. WPB representatives are present throughout the exhibit to assist prospective purchasers to obtain proper authorization that may be needed in concluding transactions. Many uses of the materials to be offered for sale are subject to governing regulations.

While the inventories to be offered for sale represent surplus in aircraft plants, they include items critically needed in other lines of industry.

STRETCH BOLTS FOR SAVING

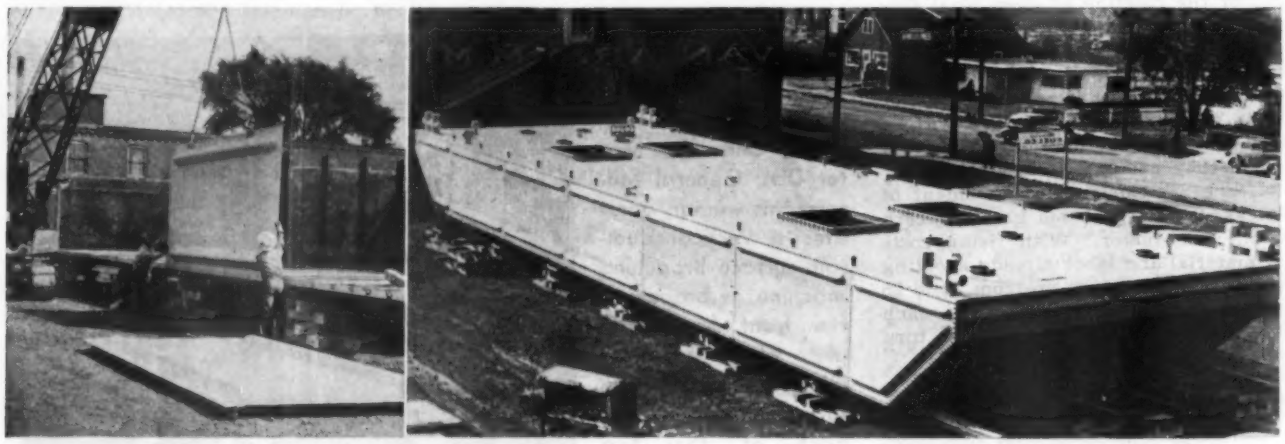
WASHINGTON—By heating the centers of 2,000,000 7/16 x 40 in. bolts, made obsolete by a change in packaging specifications of the 105 mm. shell, Army Ordnance stretched each to 44 in. And thereby the bolts were stretched from scrap value to a worth of $.20 apiece, as they became usable for the new type of packaging.

Stretching is by a so-called bulldozer—a special machine devised in the plant of the manufacturer.

Similarly, obsolete 5/16 x 42 in. bolts, formerly used for packaging 75 mm. shells were increased 6 in. by cutting some into short lengths and butt welding onto others.

Now these bolts are being collected at training centers, and from theaters of war for sending to ordnance establishments and thence to manufacturers for modification and reuse.

We'd be missing a silver (we're off the gold standard) opportunity if we didn't pun that the taxpayers dollar has been stretched a bit farther by this salvage and reuse.



Knock-down Barges—To facilitate shipment overseas, United Nations armies are using bolted, sectional steel barges, such as the above-shown adaptation of the basic design of the American Steel Dredge Co. Complete prefabrication, to a tolerance of 1/16 in. in 104 ft., into standard panels and sections marked according to a standard code and packed in a pre-determined manner, speeds assembly at site of use. They carry over 500 tons of either liquid or dry cargo

Wartime Washington

Manpower Won't Flow

Washington is finding it extremely difficult to get the war workers who have been laid off to move from one community to another. There are a number of cities in which war employment has declined because individual manufacturers have had to cut back, or have finished, contracts. The theory is that workers in these cities should be willing to go to another community where the labor situation is critical. In general, workers are balking at this proposal. Even construction workers, who now are idle because most of the war construction program is finished, are unwilling to take jobs in shipyards although such outside work is similar to their regular occupations.

The armed services have their own proposed solution for this situation. They believe that if war work declines and the resumption of civilian production is not permitted, pools of unemployed workers will result and in time the unemployed will be forced to seek jobs in other communities. Such pools also would have the effect of keeping present workers on their jobs rather than floating from one job to another. WPB is not entirely in accord with the plan of the armed services. It feels that unemployment will not long be tolerated in any community at this time and that if raw materials, plant facilities, equipment and manpower are available, the manufacture of civilian goods should be permitted at least on a limited scale.

Lay Rehabilitation Plans

The rehabilitation and retraining program for veterans proposed in the Baruch plan and carried out by General Hines is getting off to a good start. Nothing is being done hastily, the first move being to find out what programs are now being carried out by various government agencies and by local and state governments. It is likely that an agreement will be reached shortly with the national unions as to seniority for veterans. Under pending federal legislation, every service man will be offered a year of schooling and then may qualify for another three years. Some training will be done on the job in industry, many manufacturers intending to start refresher courses. Only 7,000 men out of more than a million already discharged from the services have applied for rehabilitation and some 1,400 were declared eligible. These figures are not believed indicative of what will happen after the war. At this time, veterans would rather get jobs directly in a war industry at prevailing high rates than take a training program job at considerably smaller wages.

China Plans Purchases

The Chinese are making definite plans for the industrialization of their country immediately after the war. They now are convinced that machine production is the only way to build up proper defense industries and also is the only means of attaining a high standard of living for the average citizen. Just as soon as goods can be made available, China wishes to purchase in the United States a large amount of railroad equipment, electrical equipment, power plants, textile mills, machine tools, certain agricultural implements and motor trucks. Many of the present U. S. farm implements are not suitable for use in China and one manufacturer now is engaged in designing machines that will be of the kind most useful to the Chinese. Even during the war China has managed to make progress in industrialization. She is now manufacturing radio sets and electric bulbs, is working on special steels and has a large machine shop making machine tools.

Trial Balloon

WPB Chairman Donald M. Nelson has let the word seep out that he is going to appoint Dr. William Y. Elliott, chief of WPB's Stockpiling and Transportation Division, to the post of vice chairman for civilian requirements—vacant since Arthur Whiteside left Washington over a month ago. If the reaction—particularly on Capitol Hill—is not unfavorable, Elliott's appointment will be formally announced soon. Otherwise, Nelson will hunt for another candidate.

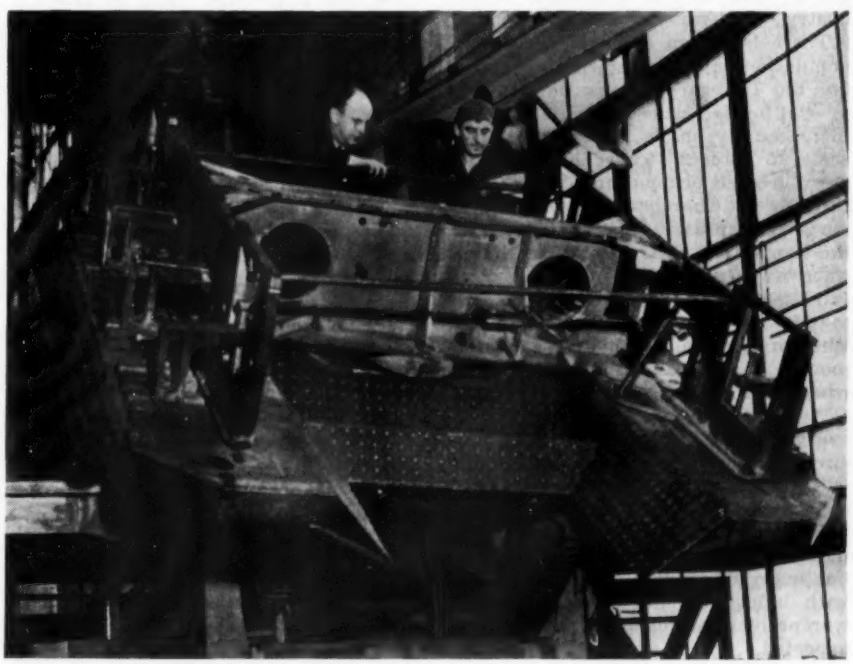
Indicator

Contract renegotiation officials are keeping a watchful eye on the Court of Tax Appeals, which has begun work on its first case involving an appeal from the decision of a price adjustment board. Under the new amendments to the renegotiation law, an aggrieved contractor can ask the tax court to review any unilateral determination by one of the procurement agencies. The first case was brought by the Allen Tool Co., Syracuse, N. Y. The tax court's handling of this case is being closely watched as an indicator of things to come.

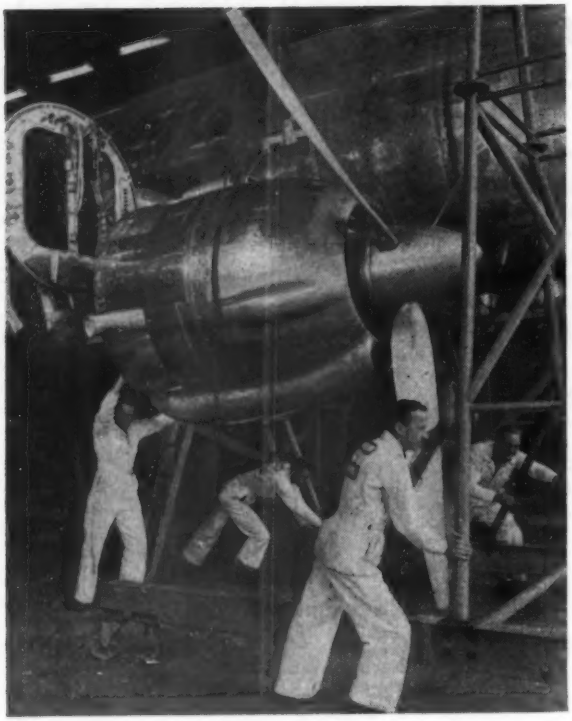
Navy and Kaiser Disagree

Navy officials, viewing Brewster Aeronautical Corporation's continuing financial troubles disagree with Henry J. Kaiser's statement that his job as president of that company is finished. When he decided to quit, Navy tried to talk him out of it and failed.

Pointing out that the Brewster contract is still only one-third finished, Navy men question Kaiser's assertion that his job is done, and some go so far as to suggest that he doesn't want to risk his reputation as an industrial wonder-worker any further by staying on.



Always Level—Non-skid foot plates set at different angles around the table of this welding positioner put a level "floor" under the operator regardless of the tilt of the table. The idea, applied at General Electric's Erie Works where heavy locomotive trucks like this one must be welded, provides greater safety in the use of the positioner for welding



Good Egg—A "Power Egg" system which permits a complete change of power plant in 27½ minutes has been developed and applied to the new four-engined Lockheed Constellation. Photograph shows one of the steps in the quick exchange of one power plant for another

Wartime Industrial Development Brings Westcoast Postwar Plans

LOS ANGELES—It appears that the Western tradition of greater size will go on—and that it will apply to industry's postwar problems.

There has been a large increase in population in the western states during the last three years, particularly in California, whose population has increased by more than a million—some 15 percent. There has been an even greater occupational shift. The Los Angeles Chamber of Commerce reports that in 1939 only 4.5 percent of the population of Los Angeles County were wage earners in manufacturing establishments, while, today, approximately 13 percent are so engaged. War production, ships and airplanes mostly, is responsible. After the war, where is the work coming from?

It is not expected, of course, that everyone now so employed will be so employed after the war. Some people will go back to their former states but experience has been that most of them will prefer to stay; some women will quit work or go back to former jobs but many of them will wish to go on with industrial employment. A postwar problem of "colossal" size may be expected.

Little Previous Development

In manufactured goods, the West has never been self-supporting. In the durable goods field, appliances, hardware, etc., for example, the eleven western states have always made less than one half of the goods they consume. Western manufacturers think that this proportion must be altered, and suggest that it should be increased enough to bring percentage of factory workers to that of the national average which was, in peacetime, about 10 percent of the population.

It is not suggested that the West attempt to secede, economically, from the United States and strive for a self-contained economy. It is known that this is impossible and unsound, but western business does believe that more goods must be made in the area, and that western manufacturers must be competitive to do this.

Worry Over Even Start

Knowing that they must compete, even for their home market, western industrialists are fearful that they may be handicapped at the very beginning of the race. They fear that their eastern competitors may get the jump on them in re-conversion. They point out that if Japan outlasts Germany, manufacturers of the Pacific Coast may be required to continue to make munitions, meanwhile losing ground to Eastern manufacturers. Whether well-founded or not, this fear exists, and shows that the western manufacturer is acutely sensitive to his competitive position, and to his responsibility for the solution of this section's postwar problems.

Manpower Shortage is Prime Chicago Producers' Headache

CHICAGO—Since the WMC delivered its long expected blow, and placed the Chicago area in the Group 1 labor shortage class on March 1, manpower troubles have had center stage among metal trades executives here.

By June 1, the local WMC director has just announced, more than 77 percent of the workers in this area will be working on a 48 hour week, as the commission continues to process the forms required under the longer work week order delivered recently.

And, to maintain the production schedules of war plants here, an additional 47,000 workers must be had by April 1. A survey has been started of aircraft plants in the area, and equipment and machinery will be studied in an effort to find ways of substituting women workers for men. Other types of plants will be studied later.

To Ration Labor

The WMC is planning to ration the area's labor supply through employment ceilings, by which labor priorities committees would hold employers to "reasonable" numbers of workers to meet their production loads, and there will be a general tightening of labor controls, in the issuance of statements of availability to stop turnover.

Meanwhile, it has been reported that the Chicago industrial area handled the second highest volume of major war supply contracts placed in any metropolitan district of the country from June, 1940, to the end of 1943. Total contracts assigned here are valued at $8,692,674,000, not including contracts of less than $50,000, or food contracts.

Ordnance contracts here have aggregated $3,202,414,000; aircraft and parts, $1,338,165,000; warcraft built at local yards, $147,248,000; and other supplies, $3,203,666,000.

Investment by the government in construction of facilities here in the 3½ year period was $981,181,000, largely in industrial plants. More than 15,000 employees are now in the services.

Plan Veteran Returns

CHICAGO—A comprehensive program of re-employment and training of International Harvester Company employes discharged from the armed services has been announced by the company, with the objective of providing a job for every qualified Harvester veteran, and to assist those not qualified because of disabilities.

All of the company's manufacturing, raw materials operations, and sales branches in the United States are included.

Every discharged veteran who makes application within 60 days after his honorable release from the services will be offered his former position or a similar one, or will be given paid training to qualify him.

Spotting the Air News

War Planes Are Mainstay

Postwar aircraft production will depend not so much upon private and airline requirements, which admittedly will be small, as upon the Government's decision whether to maintain large armed services including air forces. A strong aviation policy for Army and Navy would require the annual output of many thousand planes, whereas the airlines of this country would take only 1000 if their prewar operations were doubled. The private market will be limited to a few thousand per year—ten to twenty thousand, until such time as models can be perfected which will not need airports and which will partially substitute for autos.

Air Force Could get Support

How much military power is to be maintained by the United States will depend upon the kind of peace that is written, what international alliances may be made, and upon internal politics. A 21-man congressional committee has been appointed to begin the study of that question. It seems likely that public opinion would support a large standing air force more readily than it would support a walking army with guns and tanks. In fact the old theory that soldiers should go to war in small airplanes, just as they formerly went on horses, will persist. There will be a new drive for an Air Force Department or the combination of ground, naval and air arms into one defense organization. Not the least support for a strong air program will come from the personnel of the air forces themselves—from young majors and colonels who will prefer military careers to bookkeeping or selling.

Allied Output Sextuples Axis

For the first time in this war the British reveal figures on their aircraft production. Their total of 90,000 from the war's beginning to Jan. 1, 1944, is only 4,054 more than the 85,946 produced by the U. S. in 1943 alone. The British average in units per month during the 52-month period was 1,730 per month as compared with an average 3,073 per month by the U. S. If Britain's present rate were three times average, as ours is, it would be about 5,000 per month. Churchill recently said British and Russian production are about the same. Thus total allied production would be something like 9,000 plus 5,000 plus 5,000 or just under 20,000 per month—which is perhaps six to one over Jap and German output combined.

Vertical Riser—Kellett Aircraft Corp. has completed delivery of a service test lot of the U. S. Army Air Forces' new YO-60 autogiro. Powered by Jacobs 300 hp. engines, they are used for tactical studies and instruction

Blister Full—Lillian Nelson poses in a machine-gunner's blister at the exhibits of the Los Angeles conference of the Pacific Coast Section, Society of the Plastics Industry. Use of plastics has increased visibility materially

Airmail for Preparedness?

Despite years of talk about overnight delivery of all first class mail, and air services to every crossroads, a Civil Aeronautics Board examiner has recommended caution in the certification of feeder routes that will not pay their way. This brings up the basic question of policy on domestic air transport: shall the airlines be limited and regulated as an economical service to the public, or shall they be expanded under high rates (subsidies) to serve as a military nucleus in any future war? Argument on both sides of this will be long and strong.

Study Jets for Water Planes

Jet power promises to make possible important improvements in flyingboat design, after a serious problem is overcome. The problem is that jet engines are so far woefully inefficient at low speeds and they reach their maximum (which is not yet very good) only at top speed. A flyingboat of given weight and power requires longer to take off than does a landplane of the same weight and power. Main reason is that the flyingboat has to overcome water drag, whereas the landplane has only aerodynamic drag. Thus, a given thrust in jet power which could easily keep the boat in the air, might not be sufficient to pull it out of the water. Many able engineers are already trying to "gear down" the jet engine for efficiency at lower speeds. When and if they do, the flyingboat will be rid of its propellers. At present, flyingboats are built high, deep of hull, to keep propellers out of water and spray.

Canadian Termination Formula Parallels Part of Baruch Plan

OTTAWA—After three months in the preparatory process, including consultations with representative industrial bodies, Canada's formula for war contract termination settlement is emerging this month. It is expected to be in the hands of all contractors, together with a staggering stack of forms which they are required to fill out and file with government agencies after termination notices are received and when presenting their claims for settlement. The formula is the work of regular officials of Munitions and Supply Department, war production control and procurement agency. It is subject to modification later on in the light of experience with its application.

The formula does not cover any questions of reconversion or the ultimate disposal of surplus war assets. These will be taken care of under other measures. Some aspects of reconversion will be dealt with under legislation setting up a Department of Reconstruction in the government. Final policy on war assets disposal probably will evolve at the present session of parliament. Control now rests with an interdepartmental policy committee at Ottawa and recently-created War Assets Corp., crown company with head office in Montreal.

Many Provisions Established

In its main principles the Canadian formula parallels fairly closely the Baruch plan for the United States. In a considerable part its provisions were already established in the termination clauses incorporated in most war contracts.

Here is how Canadian contractors will fare under the formula:

1. Completed work to paid for in full on contract terms.

2. Uncompleted work to paid for on the basis of cost plus a fair and reasonable profit. Costs to include materials required for completion of contract, unamortized portion of authorized capital outlay, depreciation as allowed for income tax purposes, overhead, labor, outstanding commitments for materials, parts, etc. Also to include cost of taking inventories, compiling reports and other work necessitated by termination.

3. In no case are termination settlement payments to exceed amount involved in contract.

4. Compensation may be allowed at the sole discretion of the Minister of Munitions and Supply for hardship suffered by contractor through termination of uncompleted contract but not for loss of profit on uncompleted portion.

5. Outlay on output which is behind delivery schedule through fault of contractor is not recoverable.

6. Settlements may be made by negotiation between a negotiations officer of M. & S. Department and contractor outside the terms of the formula but with these terms to be taken as a guide. Where agreement cannot be reached on terms of settlement the issue may be referred to the Exchequer Court but the contractor is barred from legal action to recover damages, loss of profit or other losses due to termination.

7. In case of urgent need contractors may claim and receive interim payments on settlement account, these payments to be shared on a pro rata basis with subcontractors.

8. In making inventories on which payment is claimed contractors are required to price controlled and other raw materials and purchased parts at laid down cost; work in progress and manufactured parts at cost of direct materials, labor and other charges; finished goods at contract prices.

9. Contractors are to make their own settlements with subcontractors on the same basis as the settlement between the prime contractor and the government. They are held responsible for protecting the interests of the government in the terms of these settlements and for checking subcontractors' inventories and claims, cost of such checking to be recoverable.

10. Unused materials, equipment and parts on hands of contractor at termination are to be returned to suppliers where possible. Contractor may obtain authority from M. & S. for disposal of inventory for a loss up to $5,000 and special approval for greater loss.

11. Contractor may purchase excess materials at laid down cost.

12. Inventory not disposable is to be transferred to War Assets Corporation, government agency established to dispose of surplus war assets. Government-owned machine tools are to be held for directions from Citadel Merchandizing Company and Machine Tools War Service Committee.

13. Equipment, materials and finished and unfinished work not disposed of or removed by government agencies within 60 days are to be stored by contractor and claims for storage charges submitted.

Committee Reviews Settlements

Still left open is the question of what is to constitute a "fair and reasonable" profit on unfinished work. It is being left open deliberately on the ground that the answer must depend to a large extent on circumstances attaching to a particular contract and to its termination. To be taken into account is the fact, for example, that in many cases the bulk of profit is earned on the last 25 percent or 50 percent of output called for by the contract, which portion of output might be cut off by termination. A small committee of M. & S. Department officials will scrutinize and pass finally on all settlements, and it will take such considerations into account.

Also remaining to be determined in Canada, as in the United States, is the solution of the problem of storage for surplus equipment and other war assets. This is expected to come with the coordination of disposal controls and administrative agencies.

Tunnel Power — The 57 lb., 5 x 13 in. electric motor on which George Pfau is working has a rating of 30 hp. It is one of several General Electric is building to drive the propellers of small model planes operated in wind tunnel tests. Water cooled, it can operate in excess of 7,000 r.p.m.

Names in the News

Elected to Presidencies

NEIL C. HURLEY, JR.

CHARLES R. HOOK

Selected Vice Presidents

HARRY M. HECKATHORN

JOHN P. BERNARD

Neil C. Hurley, Jr. has been advanced to the position of president of Independent Pneumatic Tool Co., Chicago. He has been associated with the firm for 12 years, and in recent years following his managership of the electric tool division he has successively served as secretary, vice president and executive vice president.

Charles R. Hook, president of American Rolling Mill Co., Middletown, Ohio, has been elected president and chairman of the board of Rustless Iron & Steel Corp., Baltimore, Md. He succeeds C. E. Tuttle, who has resigned. Mr. Tuttle's interests in the Rustless company were recently acquired by Armco.

Harry M. Heckathorn has been named vice president in charge of production of Mullins Mfg. Corp.'s Salem and Warren, Ohio, plants. He has been vice president in charge of operations of the Youngstown Pressed Steel Div. plant in Warren since 1938. Mr. Heckathorn was formerly connected with Murray Body Corp., Detroit, Dodge Bros. Co. in Detroit, and City Auto Stamping Co., Toledo.

John P. Bernard has been advanced to vice president and general manager of Sheffield Corp., Dayton, Ohio. He joined the organization in 1942 after spending 17 years with the Dyer Co., Cleveland, where he held the position of executive vice president in charge of operations.

Charles L. Tolles has been appointed president of Jewell Belt Hook Co., Naugatuck, Conn.; and **D. G. Mac Vicar** has been named sales manager.

James Cope, formerly manager of the Washington office of the Automotive Council for War Production, has joined Chrysler Corp., Detroit, as assistant to the president. Mr. Cope was connected with the Automobile Manufacturers Assn., Detroit, since 1935, and for a year prior he served as special assistant to Gen. Hugh S. Johnson of NRA.

Ellis L. Spray has been appointed assistant to the president, Westinghouse Electric & Mfg. Co., Pittsburgh, in charge of the company's manufacturing division.

W. Lyle Richeson has been named assistant vice president of American Car & Foundry Co., New York, N. Y.

He became associated with a.c.f. in 1925 at the Berwick plant. He served as sales agent for the miscellaneous sales department in New York for four years, and was transferred to the Cleveland office where he remained until 1937 when he returned to New York.

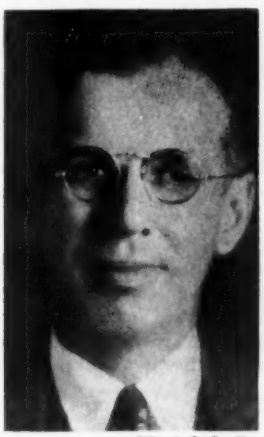
James Mac Innes has been advanced to president of Heaps Engineering Ltd., New Westminster, B. C. Formerly he was vice president of the company. **Harry J. Sullivan** succeeds Mr. Mac Innes as vice president.

Charles Schwarzler has been named manager of the export department of Foxboro Co., Foxboro, Mass. He was formerly manager of the sales promotion department.

Jack J. Chernik succeeds his father, the late Ben Chernik, president and founder of Chicago Alloy Products

Presidential Assistants of Chrysler and Westinghouse

JAMES COPE



Blank & Stoller

ELLIS L. SPRAY

New Sales Manager *Retiring LeBlond Sales Head and Successor*

JAMES McB. GARVEY

WILLIAM F. GROENE

HAROLD J. SIEKMANN

Co., Chicago, in the management of the business. The company recently moved to 19th St. & Washtenaw Ave.

James McB. Garvey has been appointed vice president in charge of sales of American Laundry Machinery Co., Cincinnati. Mr. Garvey has served as manager of the company's eastern division, with headquarters in New York, since 1929. He joined the organization as a member of the general sales department in 1922.

Charles W. France, vice president of Curtiss-Wright Corp. and general manager of the St. Louis plant for the past eight years, has been named general manager of the company's plants at Buffalo, N. Y. **Burton H. Witherspoon,** formerly executive assistant to Mr. Wright, vice president in charge of the airplane division, succeeds Mr. France as general manager at St. Louis.

William R. Kottsieper, assistant manager of sales of the valve department of American Car & Foundry Co., New York, N. Y., has been advanced to manager of that department.

Leon F. Miller has been appointed sales manager of Osborn Mfg. Co., Cleveland, succeeding R. F. Lincoln, who has resigned to enter another field. Mr. Miller joined Osborn in 1929 and has served in both sales and engineering in the foundry and machine fields.

Robert A. Campbell has joined the steel tube division of Talon, Inc., Oil City, Pa., as sales manager. Mr. Campbell was formerly assistant sales manager of Ohio Seamless Tube Co., Shelby, Ohio.

Charles W. Sprenger has been named district manager for the metropolitan New York district of Carborundum Co., Niagara Falls, N. Y. He will make his headquarters at the sales office located at 601 W. 26th St.

W. H. Feldmann, vice president and general manager of Electric Machinery Mfg. Co., Minneapolis, has been advanced to president and general manager. He has been associated with the firm for 22 years.

R. P. Exten has joined Young Radiator Co., Racine, Wis., as executive assistant to the president. He began his business career with Studebaker Corp. and served in various capacities with Timken-Detroit Axle Co. and Hudson Motor Car Co. Mr. Exten was more recently connected with Climax Engineering Co., Clinton, Ia., and Borg-Warner Corp., Rockford, Ill.

E. W. Potratz has been appointed manager of the hoist sales division of Harnischfeger Corp., Milwaukee. He joined the company's hoist division in 1935 as an estimator, and has been acting sales manager since 1942.

John F. Robb has become manager of the Climax Molybdenum Co. in the Pittsburgh district. Before joining Climax in 1935, Mr. Robb was connected with Carpenter Steel Co., Reading, Pa., Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., Pittsburgh Crucible Steel Co., Pittsburgh, and Brighton Electric Steel Casting Co., Beaver Falls, Pa.

BUSINESS ITEMS

Aga Metal Tube Co., Elizabeth, N. J., has announced a change in its name and address. The company is now known as **Agaloy Tubing Co.** and has moved to larger quarters at Springfield, Ohio. **E. Q. Smith,** formerly vice president of Bundy Tubing Co., Detroit, has become president of Agaloy Tubing. **W. W. McMinn** is vice president, and **John J. Judge,** formerly of Babcock & Wilcox, Barberton, Ohio, is factory superintendent.

Logansport Machine Co., Logansport, Ind., maker of air and hydraulic equipment, has appointed **Rudel Machinery Co.,** New York, N. Y., and W. Hartford, Conn., as its representative succeeding Frank G. Kernan.

Duff-Norton Mfg. Co., Pittsburgh, manufacturer of jacks for industrial use, has moved its eastern district offices from the Empire Sate Bldg., New York, N. Y., to 250 Park Ave.

Smith Richardson Co., Wakefield, Mass., manufacturer of precision metal parts, will henceforth be known as the Fraen Corp. The company has materially increased its facilities.

Electric Service Supplies Co., Philadelphia, producer of transportation equipment, power protection devices, industrial haulage systems and electric shop tools, has changed its name to **Electric Service Mfg. Co. A. H. Englund,** executive vice president, has recently been advanced to president.

MEETINGS

American Gear Manufacturers Assn. Spring meeting. Westchester Country Club, Rye, N. Y. May 22-24.

American Iron & Steel Institute. Waldorf-Astoria Hotel, New York, N. Y. May 25.

American Management Assn. Production Div. Drake Hotel, Chicago, Ill. Apr. 19-20.

American Society of Mechanical Engineers. Spring meeting. The Tutwiler, Birmingham, Ala. Apr. 3-5.

Chamber of Commerce of the U. S. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. May 3-5.

National Metal Trades Assn. Annual meeting. Biltmore Hotel, New York, N. Y. May 17-18.

Society for the Advancement of Management. Drake Hotel, Chicago, Ill. Apr. 28-29.

Society of the Plastic Industry. Annual meeting. Edgewater Beach Hotel, Chicago, Ill. May 11-12.

Westinghouse Machine Tool Forum. Wm. Penn Hotel, Pittsburgh. May 1-2.

Shop Equipment News

Rogers turret mill

Rogers Makes Coolant System For Perfect 36 Turret Mill

A special coolant system is available from Rogers Machine Works, Inc., 125 Arthur St., Buffalo 7, N. Y., for the Perfect 36 vertical turret mill made by the company. The design of this system permits the delivery of two streams of coolant to the tool and the work through flexible tubing.

The pump, driven by a direct connected fractional horsepower motor, is mounted on the base. This pumping unit is self-contained and self-priming. Pump starting switch is connected to the main switch. Coolant flows back to the lowest point on the frame where it is picked up, cleaned and recirculated to the tool and work.

Norton 57 Alundum Wheels Now Made for General Use

Grinding wheels made of 57 alundum abrasive are now available for general use from Norton Co., Worcester, Mass. This abrasive has a fast, cool cutting action, and is said to have the ability to hold its shape and require few dressings. These grinding wheels are furnished in Norton BE vitrified bond as well as in regular vitrified bond in a wide range of grain sizes, grades and structures.

Landis Announces No. 12 Centerless Grinding Machine For Through-Feed, In-Feed and End-Feed Operations

Landis Tool Co., Waynesboro, Pa., recommends its new No. 12 centerless grinding machine for most through-feed, in-feed and end-feed operations. The regulating wheel-base is completely self-contained. Spindle drive is by means of an adjustable speed motor through multiple V-belts. Thus, an infinite number of wheel speeds may be obtained, through a control knob, without interrupting the grinding cycle.

The regulating wheel-base cross-slide is hydraulically operated. This facilitates dressing the regulating wheel, as the wheel face is traversed across the point of a positively held diamond. The path of contact between the regulating wheel and the diamond is the same as the path between regulating wheel and work.

In through-feed grinding, no readjustment of the dresser is required when tilt of the regulating wheel-base is altered. The hydraulically operated cross-slide provides a means of accurately aligning work rest blades. The regulating wheel-base may also be traversed by a screw adjustment to permit quick axial alignment of regulating and grinding wheels. The regulating wheel-base may also be swiveled for grinding tapers.

The grinding wheel-base is also self-contained and driven through multiple V-belts.

Controls are grouped at the front of the machine within easy reach of the operator. Included are a master start button for all electric motors, a master stop button and a three-stage motor selector switch. The latter pro-

Landis No. 12 centerless grinder

vides a work setup stage, grinding stage and dressing stage. Regulating wheel speed automatically increases for the dressing operation. A large grinding wheel feed handwheel, with micrometer dial, makes possible feed settings in tenths, in terms of work diameter reduction.

Net weight of the machine, including electrical equipment, is 8,000 lb. The grinding wheel is powered by a 15-hp. constant speed motor.

Heller Line of Rotary Files Made in Variety of Shapes

A line of hand cut rotary files for use on flexible or stationary shaft filing machines, portable electric and air tools and similar devices has been produced by Heller Brothers Co., 880 Mt. Prospect Ave., Newark, N. J. The files are available in flame, ball, cone, tree, oval, cylindrical, tapered and other shapes for fast cutting of hard metals. Each shape is made in a number of sizes, as well as in rough, coarse, fine and smooth cuts.

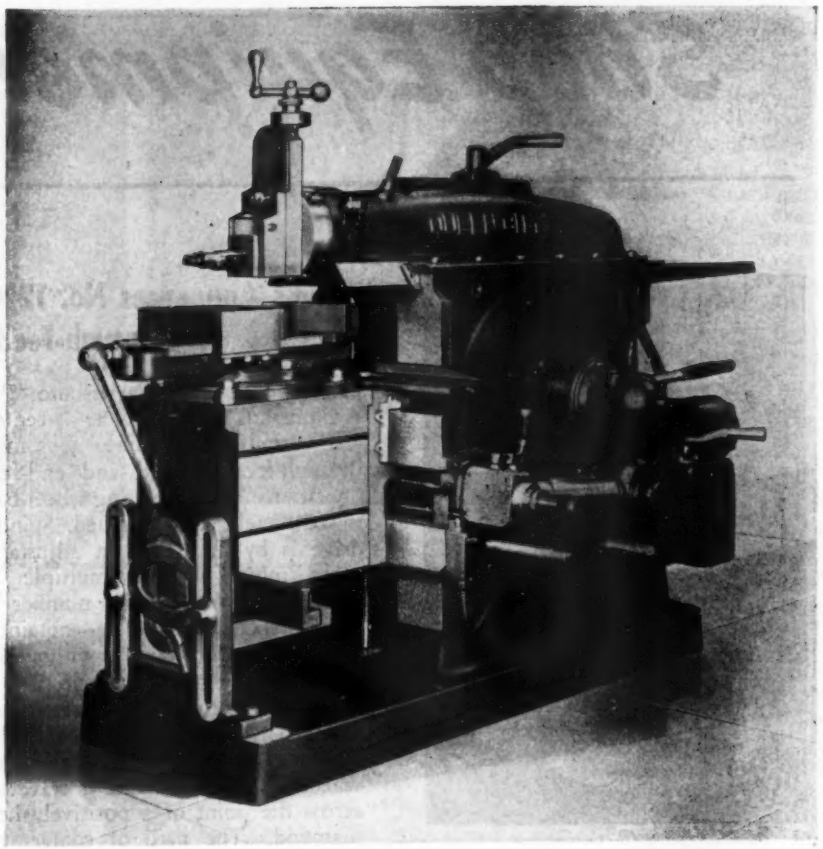
Howe Double Ratio Scale Will Count Small Parts

A double ratio scale designated as Type 1133-C is offered by Howe Scale Co., Rutland, Vt. It is especially adapted for counting small parts because of the high sensitivity provided by a third pan attached to the lower beam lever. The unit is fully automatic.

This scale has a counting capacity of 40 lb. and a total weighing capacity provided by two beams of 20 lb. by 1 oz. A target type, flush indicator is claimed to eliminate parallax and provide easy "over and under" determination.

The platform measures 8¾ in. in diameter and is beaded to hold a scoop 19½ × 10 × 6 in. Overall height and length of this scale is 27 in., and its width is 15 in.

Howe double ratio scale



Queen City Super Twenty shaper

Queen City Makes Super Twenty Shaper, Adapted to Machine Shop and General Toolroom Production Work

The Super Twenty, 20-in. shaper now being produced by the Queen City Machine Tool Co., 236 E. Second St., Cincinnati 2, Ohio, is said to be readily adaptable to a wide variety of machine shop work as well as heavy and general toolroom work. The feed range provided ranges from 0.008 in. for finishing to 0.191 in. for heavy cuts. Feed changes are made by simply turning a knob.

A V-type ram with wide bearings on both bottom and sides is provided and the column is said to be well ribbed for sturdiness. All gears of the speed train are hardened and shaved. The main bull wheel gears and the back gear train are helical. A dry multiple disc type clutch is used.

A high torque motor for the power rapid traverse is standard equipment. It is push-button controlled from the operating side of the machine and can be operated even when the feed is engaged. In machining an irregular surface, it is not necessary to disengage the feed to apply the power rapid traverse; the table can be fed through the portion of the cut and then by applying the rapid traverse, the table can be moved over to start the cut on the next surface.

Should the table be moved too far to either side, a limit switch operates and stops the power traverse motor and the main motor drive so that if the power rapid traverse control or the feed is overrun the entire machine stops.

Table design is such that it is given full support regardless of whether it is centered or moved to the extreme ends.

J. & S. Radii, Angle Dresser Features Fluid Motion Action

The Model E Radii and angle dresser manufactured by J & S Tool Company, 477 Main St., East Orange, N. J., is now announced in an improved type. Fluid motion, used to describe operation of the dresser stems from the fact that angles tangent to the radius are blended in one motion.

The Model E can be used to form convex or concave radii from 0 to 3 in. to tolerances of 0.0001 in. It has wheel capacity of 14 in. and provides

Double Duty in YOUR TOOL ROOM

. . . with the Lodge & Shipley Tool Room Lathe, equipped with Universal Relieving Attachment . . .

All the usual jobs, PLUS the ability to do—end, internal, external, plain, angular, or spiral relieving work. Investigate these advantages.

END RELIEVING

PLAIN RELIEVING

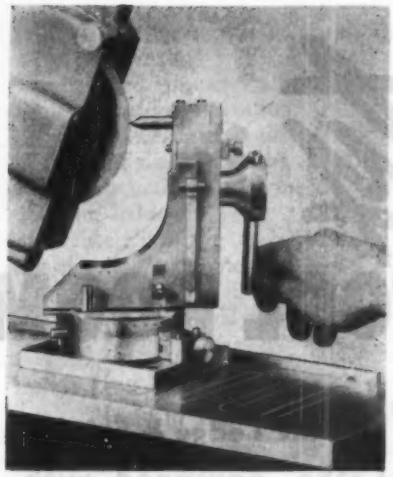
GOOD LATHES ONLY — LODGE & SHIPLEY — SINCE 1892

Original Navy "E"
Awarded March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES



J & S radii dresser

angular travel of 2¼ in. The unit stands 8½ in. high from a 4 × 5 in. base. This dresser can be used on most surface and cylindrical grinders. An extra attachment is available for dressing U-shaped 180 deg. concave radii.

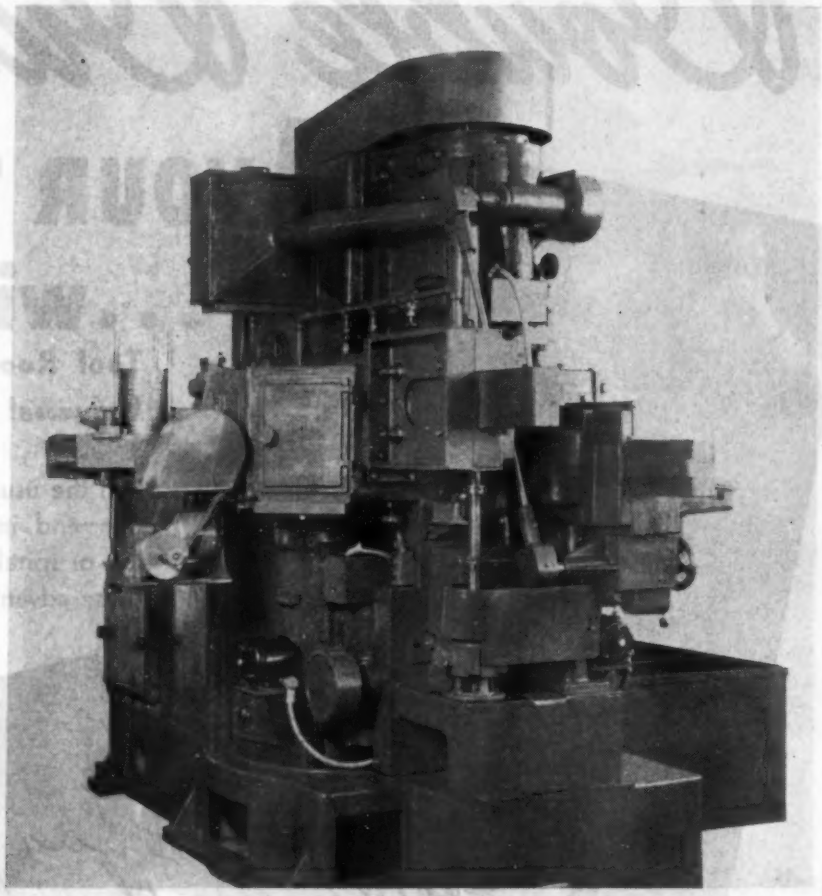
Famco sheet metal shear

Famco Sheet Metal Shear Made in Foot-Operated Model

A foot-operated sheet metal squaring shear has been produced by Famco Machine Co., Racine, Wis. It is available in 22, 30, 36, 42 and 52 in. widths. The last three sizes are furnished with a hold-down attachment to hold the stock in place as it is being cut. All models are equipped with front, back and side gages.

The cross-head is reinforced with a steel tierod to maintain proper knife alignment. Compression springs are encased to eliminate their breakage. Knives are capable of shearing up to 18 gage mild steel. Depth setting is accomplished with back gages that are moved on heavy support rods through graduated racks and pinions.

Besly Adds Two Machines for Parallel Grinding On Such Parts as Washers, Oil Seals, Bearing Races



Besly No. 926 vertical spindle surface grinder

Two machines, now available from Charles H. Besly & Co., 118 N. Clinton St., Chicago, Ill., are designed for accurate grinding of parallel surfaces such as are needed on bearing races, piston rings, oil seals and the like. These are known as Besly grinders No. 253 and No. 926.

The No. 253 is a 42-in. horizontal double spindle machine for both rough and semi-finish grinding parts having approximately equal area on parallel surfaces. Several types of fixtures—such as semi-automatic feedwheels, semi-automatic roll-feeds, power oscillating fixtures and reciprocating planer-type table can be used with the machine. It comes equipped with a vertical bar-type wheel dresser that is power driven, has automatic reversing switches, push-button control and a dresser bar to take diamond or star cutters. This machine can handle work up to a rate of 12,000 pieces per hr.

The No. 926 is a vertical double spindle grinder for finish grinding such parts as those semi-finished on the No. 253 machine. Abrasive wheels used range from 120 to 320 grit.

Work feeding mechanism is of the semi-automatic magazine type, equipped with quick-change endless feed chains. Multiple-station rotary feedwheels mounted on a vertical spindle fixture can also be furnished.

Nork Toolmaker's Wiggler Has Interchangeable Shafts

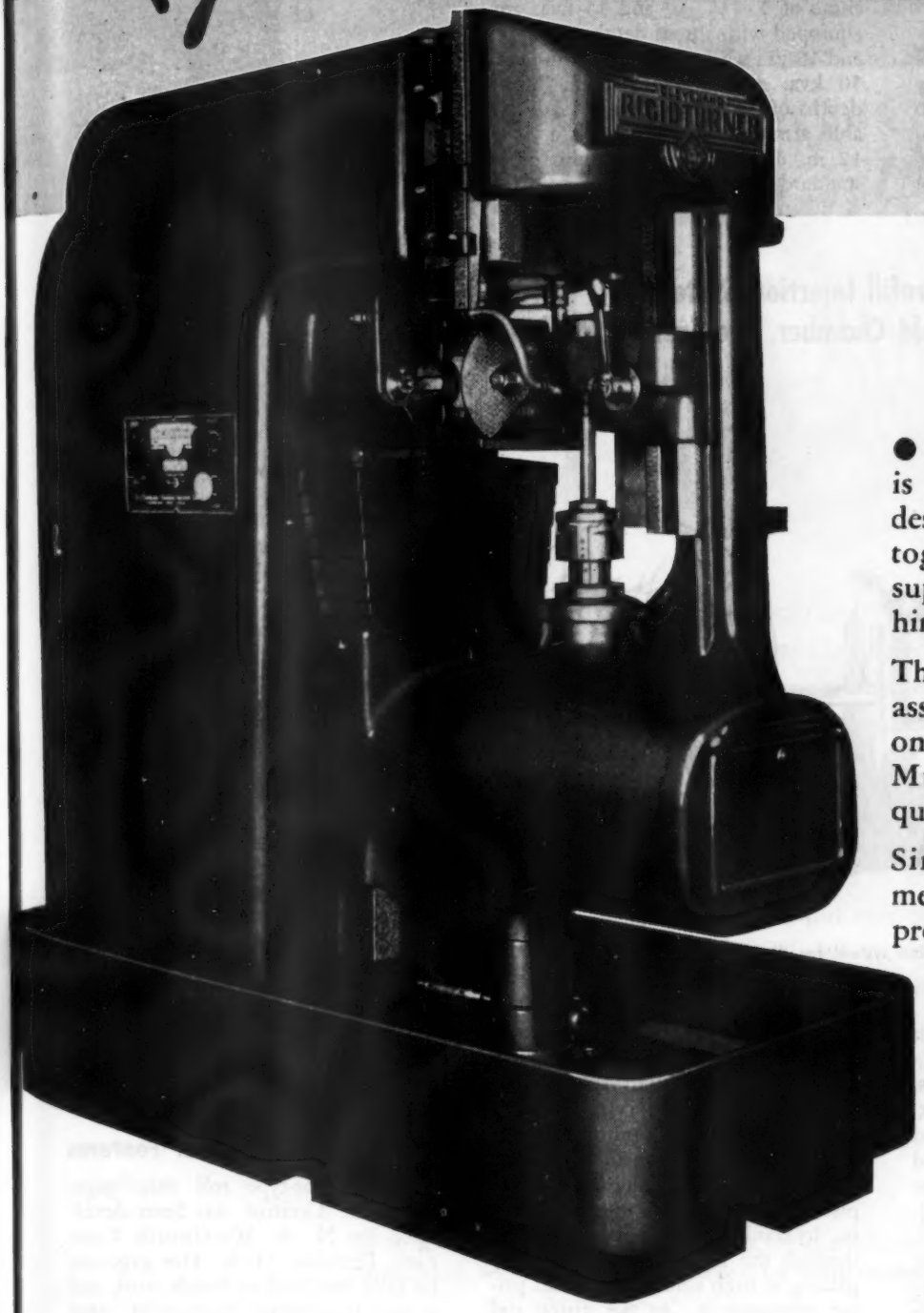
A tool and diemaker's wiggler with three interchangeable shafts is offered by Nork Products Co., 5897 South Main St., Los Angeles 3, Calif. The ball shaft is used for indicating from ground or machined surfaces and from gage blocks, also for indicating from the side of round bars.

The bent shaft is designed to hold any type indicator, either on the shank or in the hole. It is used for locating from toolmakers' buttons or holes and allows the ball of the indicator to be positioned on any circle from the center of the spindle to a diameter of 6 in.

The needle-point shaft is used to

ON JOBS LIKE THESE

THE *Rigidturner* SAVES TIME AND COSTS



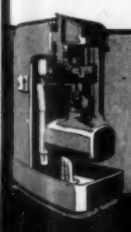
● First because the machine is particularly rigid. Vertical design ties knee and tailstock together. The cutter also has support both in front and behind the tool.

The use of the formed cutter assures absolute duplication of one or ten thousand pieces. Multiple diameters are cut quickly and accurately.

Simple operation—operator merely loads the machine and presses a button. Machine functions automatically from then until cut is completed, when it stops for a reload.

Write for booklet

This fully descriptive booklet tells all about multiple diameter turning on the Rigidturner. Explains operation of machine in detail—shows advantages of this unique method in accuracy—in production—in low cost operation.



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

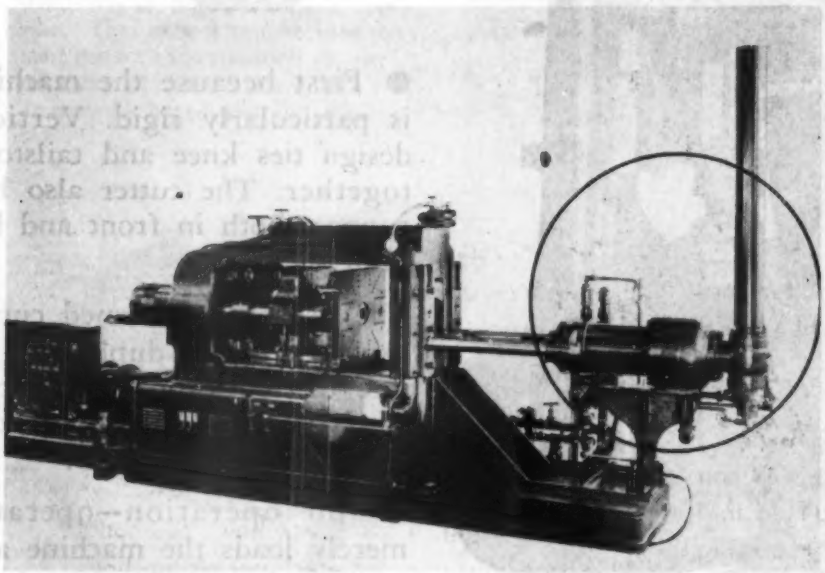
find centers and true-to-layout lines in the same manner as the ordinary wiggler. A spring chuck permits interchanging the shafts without repeated adjustment of the chuck.

Larkin Spot-Welding Machine Has Various Heat Stages

A 20 kva. spot-welder is offered by Larkin Lectro Products Co., 220 Taaffe Place, Brooklyn 5, N. Y. Features of the machine include water-cooled tips, adjustable pressure pivot type pedal, 6 to 25 heat stages and automatic trip switch, precision timers and contactors and high power factor correction. The welder can be air or motor driven.

The complete line of resistance welders ranges from 1 to 75 kva. Machine of 5, 7½, 10 and 15 kva. are equipped with throat depths of 6, 12 and 18 in., while sizes 20, 30, 40 and 50 kva. are furnished with throat depths of 12, 24 and 36 in. Adjustable arms are available with a 5 to 12 in. drop or a 5 to 15 in. drop standard.

Lester-Phoenix Introduces Prefill Injection System For High Pressure, Cold Chamber, Die-Casting Machine

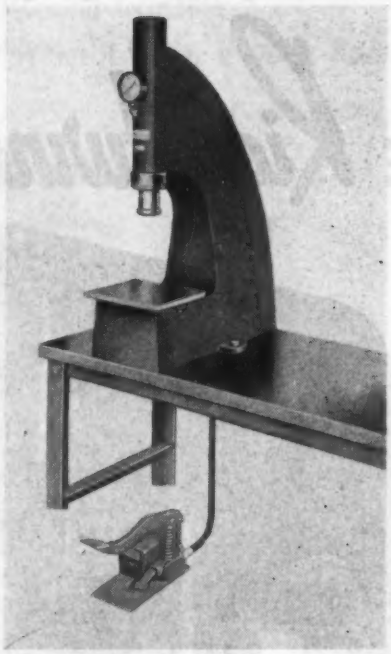


Lester-Phoenix prefill injection system for die-casting machine

A prefill injection system, which eliminates necessity for hydraulic accumulators on die-casting machines, has been designed by Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio, for its high pressure, cold chamber die-casting machines for aluminum, brass and magnesium alloys.

Injection pressure is stepped up as high as 33,000 lb. per sq. in. in the production of 3 lb. aluminum castings, and this pressure is held on the injected metal as it chills in the die. This is known as the "slow squeeze" injection method, wherein the molten metal is injected into the die slowly, so air and gases can escape ahead of the metal. High speed injection prevents the escape of air and gases because hot metal is squirted against the die walls, sealing and closing air vents. No recharging of nitrogen is necessary in this system.

The prefill injection system consists of a hydraulic cylinder fitted with a large actuating piston, the hollow piston rod of which contains a passageway to a smaller inner fixed piston. Oil under 1,000 lb. per sq. in. hydraulic pressure is introduced through the hollow piston rod, displacing at high velocity the small piston opposing it. As the piston rod moves forward, oil flows by gravity from a vertical storage tank to occupy the space back of the large piston. When the die cavities have been filled, 2,000 lb. per sq. in. oil pressure from a booster pump is applied directly to both pistons. When the injection piston reverses, oil is returned to the gravity tank, ready for the next cycle.



Reimuller hydraulic press

Reimuller Hydraulic Press Is Portable Gap Style Unit

A gap style hydraulic press for small press operations has been produced by Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Ill. It is made in two models of 10- and 20-ton capacity, and will handle 18 in. diameter work. Overall height of this equipment is 44 in. in the 10-ton model and 46 in. in the larger unit. Base dimensions are 11×24 and 13×24 in. respectively. Throat opening is 9 in. on both models.

Two levers are used in the hydraulic foot control, one applying even pressures of any degree, the other for release. The press is portable and can be shifted to any machine or bench.

Woodworth Roll Snap Gage Has Comparator Features

A comparator-type roll snap gage, called the Limitrol, has been developed by N. A. Woodworth Company, Ferndale, Mich. This gage can be used for hand or bench work and is said to combine features of other type roll snap gages and dial indicators.

Limitrol is designed to perform six inspection operations, for it checks pitch diameter, lead, taper angle, straightness and out of roundness. It is available in six nominal sizes, in steps of ⅛ in., from ¼ in. to ⅞ in., and each size is adjustable ⅛ in. either way from normal size. Rolls

McCROSKY *Time Savers*

McCROSKY tool-holding devices save time by eliminating time-out for tool changes on drill-press and lathe jobs requiring a series of operations.

With a McCrosky Turret Tool Post, the operator can set up tools before work begins on a multiple-operation job. Each tool can then be quickly and accurately indexed into cutting position without stopping or slowing the spindle. Indexing accuracy and extreme rigidity under the heaviest cuts are insured by McCrosky's exclusive meshing lobes and cam-locked handle. McCrosky makes turrets in a wide variety of styles and sizes to equip engine lathes with turret-lathe advantages and to fit bench lathes with this time-saving feature.

The McCrosky Wizard Quick-Change Chuck and Collet Outfit permits continuous performance on multi-operation drill-press jobs. The operator can change tools quickly and easily without stopping or slowing the spindle. To insert a tool, he merely pushes the collet into the revolving chuck. McCrosky's exclusive double bearing in the chuck holds the collet and tool rigid and centered, permitting horizontal as well as vertical use. The operator can bottom tap safely at drilling speed with the protection given by the Wizard Friction-Drive Tapping Collet. McCrosky makes Wizard Chucks in four different sizes, with standard collets covering a wide range of tool sizes.

Ask for bulletins and engineering data material on these McCrosky Time Savers by unit name.

COST CUTTING TOOLS

EST 1904
McCROSKY
TOOL CORPORATION
MEADVILLE PA

SUPER ADJUSTABLE REAMERS
ADJUSTABLE BLOCK BORING BARS
JACK-LOCK MILLING CUTTERS
SPECIAL-PURPOSE CUTTING TOOLS
WIZARD QUICK-CHANGE CHUCKS
TURRET TOOL POSTS

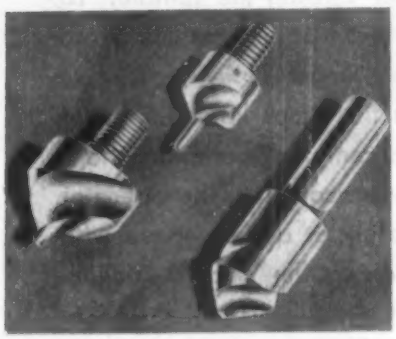
are provided in three widths, 3/8, 5/8 and 1 in.

For gaging parts within 0.004 in. tolerance or less, magnification of 250 to 1 is available and magnification of 150 to 1 for greater tolerances.

The gage is made with both plain and threaded rolls and is available in both open and closed end models.

Woodworth Limitrol gage

Different pitch rollers are interchangeable and a set may be replaced in less than five minutes. To set the Limitrol it is necessary only to place a master between the rolls and turn an adjusting screw on the bottom until the indicator arm moves up under the proper limit bar.



Farnham countersinking cutters

Farnham Countersink Cutters Made in Wide Range of Sizes

Farnham Manufacturing Co., 2061 South Park Ave., Buffalo 20, N. Y., has a line of countersinking cutters for use on all types of countersinking machines and devices.

These cutters are made to fit 3/8, 1/2, 5/8 and 13/16 in. body diameters. Rivet angles are made for all standard rivets and screws. Farnham cutters are made also in the built-in pilot style. Interchangeable pilots in these cutters permit their use for several sizes of holes.

Ridge Makes Pipe Reamer Which Features Long Taper

A pipe reamer of extra long taper design is offered by Ridge Tool Co., Elyria, Ohio. As a result of the long taper, this Ridgid reamer is said to avoid flaring, splitting or reducing wall of pipe, and cuts the burr cleanly from the inside of a pipe or conduit. It is furnished with a ratchet handle, or can be used with the handle of Rigid No. OOR ratchet threader.

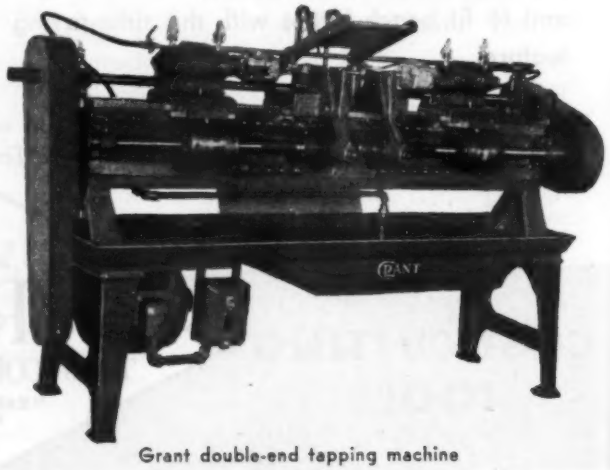
Grant No. 3 Tapping Machine Has Double-End Operation

Grant Manufacturing & Machine Co., 90 Silliman Ave., Bridgeport 5, Conn., has produced a No. 3 double-end automatic tapping machine. Although the machine is single-purpose type, it has been designed to accommodate a range of diameters and lengths by a few changes and adjustments. When tapping and hollow milling, this tapper will take lengths up to 28 in., and up to 36 in. lengths when externally threading.

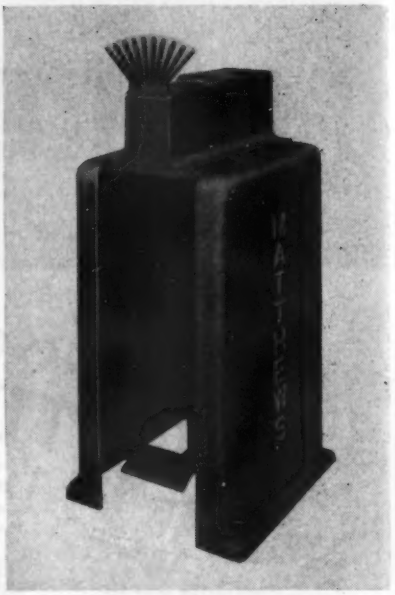
As both ends are machined simultaneously, one end can be hollow milled while the other end is being drilled; also, one end can be tapped while the other is being threaded. The mills, cutters, dieheads or tapping heads are moved along the bed, toward or away from the work in the center, by large drum type cams at the front of the machine.

Work is placed in the magazine and rolls by gravity into the feed fingers. These fingers convey each successive piece from the bottom of the guides of the magazine to a position between the clamping jaws. The forward clamping jaw is advanced by a cam, then the tapping heads advance toward the work to perform the tapping operations on each end, after which the tapping heads are withdrawn and the finished work automatically ejected.

This tapping machine occupies a floor space 23 × 85 in., and measures 53 in. high. It will tap work with a maximum diameter of 3/4 in., and will produce a maximum cut 2 1/4 in. long. The machine requires a 3 hp., 1,150 r.p.m. motor. The machine as shown weighs approximately 2,450 lb.



Grant double-end tapping machine



Matthews tag embossing machine

Matthews Metal Tag Embosser Takes Coiled Strips or Tags

The Quick-Set machine for embossing metal tags or tags from coil stock has been produced by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa. This machine occupies a floor space 18×18×39 in. high, and weighs 165 lb.

The machine can be supplied to emboss as many as 16 characters at one time, from 3/16 to 1/2 in. in size, with each embossing bar limited to a maximum of 13 characters. Maximum tag thickness recommended for use with the machine is 24 gage. One line of characters only can be embossed.

Projecting levers on top of the Quick-Set machine move the steel bars forward or backward into position for the embossing operation. The material is placed into a side slot and the set-up is embossed by a light kick of the treadle.

We would really like to know the answer ourselves. The facts in the case are that Genesee today is one of the Nation's major producers of Dovetail tools just as it is among the leaders in the production of many other types of special tools.

It may have something to do with jealous maintenance of quality—though we know other companies make good tools too. It may have something to do with deliveries—though we haven't been too happy at times in the past when we looked at our banks of unfilled orders. Somehow "price" can't be the answer, for we have never sacrificed quality for the sake of price.

Perhaps it's just a combination of all of them. If you know, won't you tell us?

We welcome your comments and inquiries.

GENESEE TOOL COMPANY

FENTON, MICHIGAN

★ Registered Trade Mark

Metal tag blanks are supplied in size and gage desired, and coil stock can be furnished in various widths, gages and lengths.

De Sanno Disks and Wheels Made of Synthetic Rubber

A. P. de Sanno & Son, Phoenixville, Pa., has manufactured a synthetic rubber abrasive disk and wheel in standard range of thicknesses and diameters up to 20 in. It is said that these wheels and disks provide fast cutting qualities on cold rolled and high-speed steels, roller bearing stock, glass rods and tubing.

Palmer-Shile Makes Truck And Square Trunnion Box

A square trunnion box is being manufactured by Palmer-Shile Co., 780 South Harrington Ave., Detroit 17, Mich. This box is made of 12 gage steel plate and is water tight. It measures 18 × 18 × 24 in. high.

A truck has been designed also to handle the trunnion box. It is built

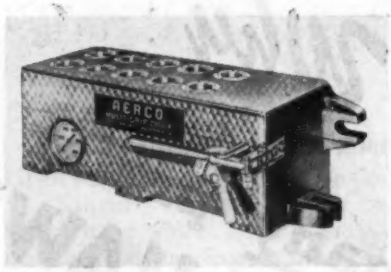
Palmer-Shile square box and truck

of heavy bar stock and has tubular handles. The wheels are 10 × 2½ in., roller bearing. The operator pushes the truck to where its forked side arms engage the trunnion, then pushing down on the truck handles picks the box off the floor. One truck will handle a dozen or more boxes. The trunnion box may be used also with sling or overhead hoist.

Aerco Milling Machine Chuck Holds Ten Parts at One Time

A hydraulic multi-grip milling machine chuck has been announced by Aerco Corp., Hollydale, Calif. The unit is available in two models: Model 10-B with collet capacity of from ⅛ to ½ in., which measures 14¼ × 4½ × 4½ in.: Model 10-E, with collet capacity from ½ to 1¼ in., which measures 21 × 6¾ × 6¾ in. Round, square and hexagon collets are available for both chuck models.

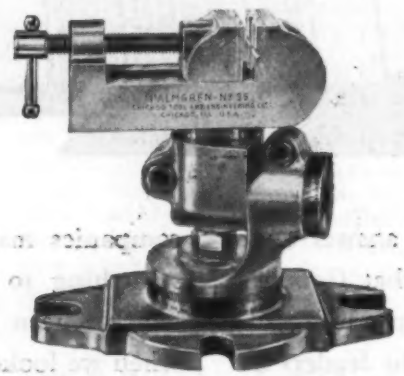
This chuck has two rows of five collets, permitting the milling of both rows of parts simultaneously. A few strokes of the hydraulic hand pump



Aerco multi-grip chuck

supplies pressure for closing all collets simultaneously, building up pressure to as much as 2,500 lb. per sq. in. These chucks can be used for both vertical and horizontal milling.

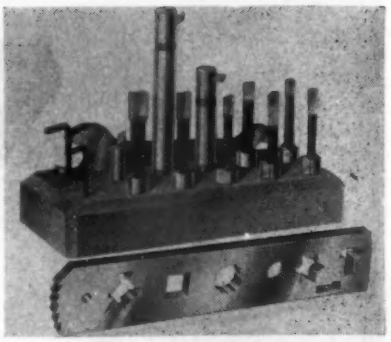
An automatic safety stop prevents damage to the collets if all stations are not filled. Collets operate on a double taper, one at each end. An adjustable depth stop is provided for each collet so that the pieces to be milled may be inserted the required amount without the use of gages.



Chicago chip breaker grinder fixture

Chicago Grinder Fixture Will Adjust to Any Angle

For grinding carbide-tipped tools, dressing grinding wheels and precision grinding of small parts, Chicago Tool & Engineering Co., 8354 South Chicago Ave., Chicago 17, Ill., has available a chip breaker grinder fixture. It has three full 360 deg. graduated adjustments. Positive locking at all angles is provided in this fixture.



Bridgeport shaping tool set

Bridgeport Shaping Tools Come in Standard Set of Ten

A shaping tool set is offered by Bridgeport Machines, Inc., 52 Remer St., Bridgeport 6, Conn. The set consists of seven shaped tools and three standard toolbit holders. Various shapes can be cut with these tools as shown on the sample piece illustrated. The tools were designed for use with the shaping attachment recently developed for Bridgeport milling machines. The set comes in a handy storage block, as shown.

Invincible Tool Attachments For Collet or Drill Chuck

A line of 45 and 90 deg. angle tool attachments have been produced by Invincible Tool Co., 501 Empire Bldg., Pittsburgh 22, Pa. These attachments are held in either a draw-in collet or a drill chuck on any flexible shaft. The burrs or rotary files can be held in the threaded end of the attachment or in a drill chuck.

The tools are available with bronze or needle bearings. Equipped with bronze bearings, it is said that speeds up to 15,000 r.p.m. are possible by use of a grease developed especially for the tools. Needle bearing tools are said to reach speeds up to 5,000 r.p.m., using this grease.

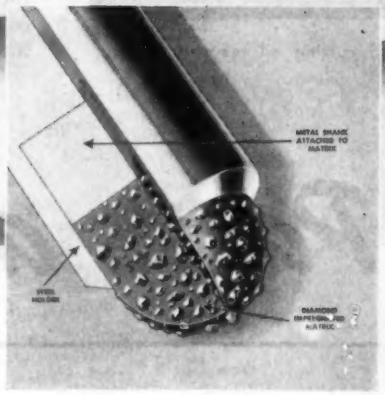
Hilliard Oil Recovery Plant Extracts Oil From Metal Chips

A cutting oil recovery plant for extraction of oil from metal chips, for filtering and sterilizing the oil is offered by Hilliard Corp., 400 West 4 St., Elmira, N. Y. The plant is available in small and large capacities.

Chips are placed in the chip wringer and the extracted oil flows through the removable baffle screens into the accumulator tank. A motor driven pump picks up the oil and forces it through the oil filter. This

This DIAMOND DRESSER *Conserves Diamonds*

—SAVES 25% IN DRESSER COSTS



WITH diamond-impregnated Carboloy Dressers you save at least 25% annually in dresser costs—get uniform, dependable results and use as much as 90% of the diamond content. Every carat does extra duty—with no time out for remountings.

These unusual results are possible because Carboloy Dressers contain a special carbide matrix that holds even extremely small particles of diamonds securely. Each dresser matrix is loaded from base to peak with sharp diamond particles. Just a quarter turn in holder daily exposes new, sharp, cutting surfaces throughout an extremely long period of life. Try Carboloy Dressers for maximum economy, maximum diamond usage and long, trouble-free, abuse-proof service. Write for folder DR-100.

Quarter section of the Carboloy Dresser shown above. Fits all standard holders. No remountings necessary. To get a new cutting surface, simply give dresser a ¼ turn in holder. Long periods of continuous service. 2 minutes to "recondition" when required at infrequent intervals.

CARBOLOY COMPANY, INC.,

11149 E. 8 Mile Road, Detroit 32, Mich.

Birmingham, Ala. Chicago Cleveland Los Angeles Newark Philadelphia Pittsburgh Seattle Thomaston

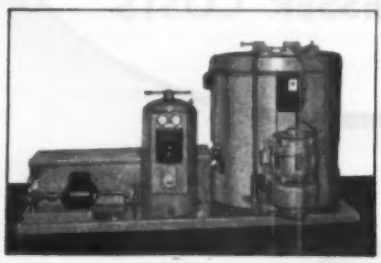
Also sold through leading mill supply distributors

Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND IMPREGNATED DRESSERS

For GENERAL USE ON GRINDING WHEELS

Hilco unit is equipped with electric heaters and contains the filtering material. After the oil is filtered clean and sterilized, it passes to the clean oil tank. Dirty oil can be taken by means of the pump from the accumulator tank and delivered for storage into the dirty oil tank. When a large quantity has been accumulated, it is then passed through the filter into the clean oil tank.



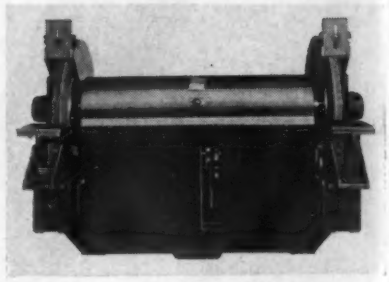
Hilliard cutting oil recovery plant

Marschke Vari-Speed Grinder Equipped With 30 In. Wheels

Vonegut Moulder Corp., 1819 Madison Ave., Indianapolis, Ind., is manufacturing a Marschke vari-speed grinder with 30 in. wheels. The machine offers the choice of a 25 hp. motor with 5-strand drive, a 30 hp. motor with 6-strand drive, or 40 hp. motor with a 7-strand drive.

This grinder occupies overall floor space 84 × 60 in., measures 35 in. from the floor to center of spindle, and is 64 in. between the wheels. Overall spindle length of this machine is 82⅜ in. The work-rest top plate is 9 × 13½ in., and vertical adjustment of the work-rest is 4 in. Net weight is 4,000 lb.

Motor, variable speed transmission and bearings are covered to protect them against external contacts and coarser particles of dirt, but each is fitted with auxiliary seals to exclude



Marschke vari-speed grinder

finer particles of dust. The lower pocket part of the wheel guard is an integral part of the base. Only the upper part of the guard is adjustable. Work-rest is attached to this upper section. The top plate is sufficiently large to provide a means for attaching fulcrum pins or pegs for pressure bars, and may also serve as a base for grinding fixtures.

Parts and Materials

Leiman rotary airmotor

Leiman Makes Rotary Airmotor In Wide Range of Horsepowers

A rotary airmotor has been designed by Leiman Bros., 101 Christie St., Newark, N. J. It offers a means of providing against danger where explosive or inflammable gases or material are present as in the operation of gasoline engines or electric motors.

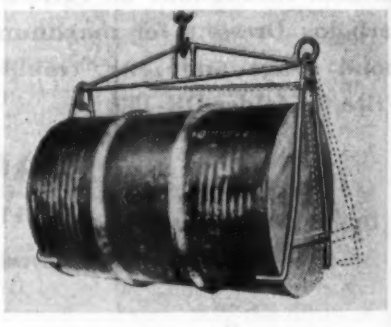
The airmotor offers a wide range of speeds and horsepowers. Compressed air used may vary from 1 cu. ft. per min. up and pressure from 10 to 100 lb. per sq. in. Horsepower ranges from 0.03 up, while the speed may be 50 or 1,800 r.p.m. or anywhere in between. The motors are reversible by the same means of air valve control. A wide range of sizes is available in this rotary airmotor.

S. & E. Soot Destroyer For Cutting Fuel Waste

S. & E. Chemical Co., 5946 West Belmont Ave., Chicago 34, Ill., is offering a powdered chemical soot destroyer for cutting fuel waste and saving time in removal of soot deposits. It is said that when brought into contact with extreme heat, such as fire bed of a boiler or focal point of the flame on an oil burner, billows of gases are released. These gases settle on the soot in the boiler, flues and chimney, whereupon combustion takes place, resulting in the disappearance of the soot. A fine white residue ash remains.

Palmer-Shile Barrel Cradle Picks Up Drums Without Chimes

A barrel cradle is offered by Palmer-Shile Co., 780 South Harrington Ave., Detroit 17, Mich. This cradle is especially designed for picking up



Palmer-Shile barrel cradle

barrels and plywood or fiber drums without flush ends, but it may be used for any other type of drum. One end of the barrel cradle is built rigid, while the other is pivoted and provided with a spring which simplifies engaging of the cradle fingers to any type drum or barrel.

. . . the metal of a million uses

Because of its many inherent virtues, brass possesses immense versatility for the production of a wide variety of stamped, drawn or spun articles. It is strong yet ductile—which makes possible deeper draws in one operation. Because of its low work-hardening rate, annealing is required less frequently or, in many instances, may be omitted altogether.

It is easy to work in any of its forms; and, with standard tool equipment, this advantage can be translated into definite economies. Long runs, high speed machinery and multiple operations—all of these spell reduced time losses, less tool breakage, closer tolerances with less adjusting time.

Because of its fine surface finish, it is ideal for plating. It has a surprising "warm" color range. And color alone is frequently a valuable sales point for any finished product.

And whatever your finished product may be, it's bound to last longer and look better in consequence of being made from brass.

• • •

While we speak of brass above in a generic sense there are actually many brasses for a wide variety of applications both for primary use and fabrication. For a summary of various brasses offered by Revere write for our new 54 page manual—"Revere Copper and Copper Alloys—Technical Information for Product Designers". This manual not only sets forth the specific qualities and properties of the various brasses but it also contains pertinent illustrated information on the whole range of Revere Copper and Copper-Base Alloys. Contains 106 graphs relating to metallographic properties in varying combinations, together with new easy-to-read chemical and physical properties chart. Send for your complimentary copy today. Address Executive Offices.

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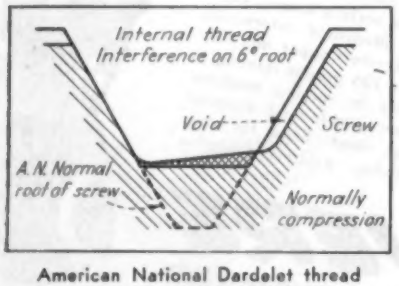
New York 17, N. Y.

Blackmer strainer basket

Blackmer Strainer Basket Made of Perforated Sheet

A strainer basket constructed of perforated sheet instead of wire mesh has been produced by Blackmer Pump Co., Grand Rapids 9, Mich. It is available in various size openings.

The use of heavy gage sheet in this basket is said to increase the net straining area up to ten times the pipe area. Some of the gain in the straining area is achieved by use of spot-welding.



American National Dardelet thread

Dardelet A.N.D. Thread Design Will Fit A.N. Tapped Hole

Dardelet Threadlock Corp., 2832 East Grand Blvd., Detroit 11, Mich., is offering a thread design based on the A.N. thread with the Dardelet thread principle incorporated. Instead of taking the interference on the blank and flowing the metal into the voids at the root of the thread, this A.N.D. thread design takes the interference at the root of the screw thread and flows the metal into the voids at the flanks. The A.N.D. stud threads are tapered downward 0.003 to the inch.

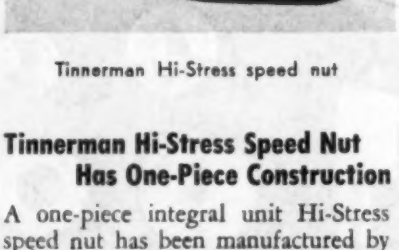
Other advantages claimed for the A.N.D. thread design include sealing against leakage through the thread fastening, increase in resistance to fatigue, increase of strength in stud in tension and torsion. It can be driven into an A.N. tapped hole after reaming. The threads on the screw can be chased, rolled or ground. Gaging is done by the ordinary method. Locking features of the original Dardelet thread have been incorporated in this design.

Air Devices dust filter

Air Devices Dust Filter Protects Generator Welder

Designed for installation on all standard types of d.c. generator welders, Air Devices, Inc., 17 East 42nd St., New York 17, N. Y., has produced a permanent, all-metal air filter. It traps dust particles before they can reach rotating parts of the equipment.

Filter medium is of the permanent type. Encased in a steel frame, it can be removed easily for cleaning. Welder filters are available in sizes to fit standard welders, and in standard or special sizes adaptable to any machine or equipment.



Tinnerman Hi-Stress speed nut

Tinnerman Hi-Stress Speed Nut Has One-Piece Construction

A one-piece integral unit Hi-Stress speed nut has been manufactured by Tinnerman Products, Inc., 2113 Fulton Road, Cleveland 13, Ohio. This nut is light in weight, and said to provide speedy insertion of screws and bolts because of a low installation torque. It is interchangeable with nut plate AN362, for high temperature applications.

Adhere Makes Toolite Material A Thermosetting Cast Resin

Toolite, a thermosetting cast resin, has been produced by Adhere, Inc., 1220 Maple, Los Angeles 15, Calif. The material is light in weight and is claimed not to break or damage easily. It has compressive strength up to 20,000 lb. per sq. in., and withstands a temperature of 400 deg. Toolite is said to be inert to ordinary cutting compounds, passes oil and water absorption tests.

M.S.A. Has Colored Filters For Protection From Dusts

For use with Comfo and Dustfoe respirators, Mine Safety and Dustfoe Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa., has designed three types of colored filter. The color shows through the transparent filter containers, permitting inspection of the filter type employed without removal from the respirator.

Filters furnishing protection against all dusts are light red in color. Light green indicates protection against fibrosis- and pneumoconiosis-producing dusts and mists. The gray colored filter is used in the Comfo respirator for protection against toxic fumes from molten metals.

Abrasive diamond wheel

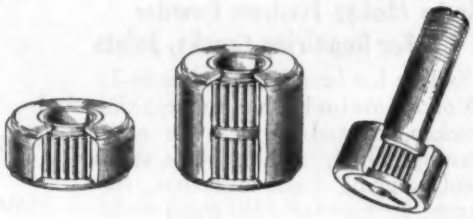
Abrasive Diamond Wheels For Carbide-Tipped Tools

Designed for fast cutting of carbides, for providing uniform cutting edges on carbide-tipped tools, for removal of excess metal on carbide dies and for radius grinding of carbide tips, Abrasive Dressing Tool Co., 1550 Broadway, Detroit, Mich., is offering resinoid-bonded diamond wheels.

How Design of Needle Bearings Aids Efficient Lubrication...

Three of the DC Type Torrington Needle Bearings show how the turned-in lips of the hardened retaining shell provide a natural storage reservoir for retention of the lubricant.

In the NCS Type Needle Bearing, the construction of the heavy outer raceway also provides a similar design feature to aid in efficient lubrication.



The RC Type Needle Bearings illustrated here show how these enclosed cam-follower type bearings will hold the lubricant within the bearing and how the design helps to *exclude* dust and dirt.

•

THIS FEATURE PROMOTES DESIGN SIMPLIFICATION; PROLONGS SERVICE LIFE; REDUCES MAINTENANCE

••

An outstanding feature of Torrington Needle Bearings is the ease and efficiency with which they are lubricated... a factor contributing to many advantages which the design engineer will quickly appreciate.

For example, the cut-away sections of the Torrington Needle Bearings illustrated here clearly show how the cupped or closed retaining shells which hold the full complement of needle rollers also provide a natural reservoir for retention storage of lubricant. Thus as the rollers rotate around their own axis and travel in a circle around the shaft, they are continually supplied with an oil or grease film.

So efficient is this simple method of lubrication that many applications have been made in which the lubricant provided in the bearing on installation lasts for the life of the equipment. (The limiting factor is usually the life of the lubricant.)

However, in any given layout or application, the design and service requirements will determine the method of lubrication as well as the type of lubricant.

All Torrington Needle Bearings are lubricated before shipment to protect them in transit and in storage. A high grade mineral base slushing compound is regularly used. It has good lubricating qualities at ordinary temperatures and should be left in the bearings on installation in applications where they will be lubricated along with adjacent parts as in gear cases, transmissions and similar locations.

Where operating conditions—load, speed, and temperature—call for another type of lubricant, Torrington Needle Bearings are supplied prepacked with lubricant to customer specifications if requested.

From long experience with hundreds of different applications, Torrington's Engineering Department will gladly advise on selecting the method best suited to the requirements of your use of Needle Bearings. In this way you are assured long life and an installation which will require a minimum of maintenance or service attention.

Further information on this and other advantages of these compact, high capactity anti-friction bearings will be found in our Catalog 105. Send for your copy today.

• • •

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

New York, Boston, Philadelphia, Detroit, Cleveland, Seattle, San Francisco, Chicago, Los Angeles, Toronto, London, England

TORRINGTON

NEEDLE BEARINGS

All popular sizes and types are included in the line. In addition to straight, pointed and rounded types with diamonds in the periphery, plain cup, flaring cup and dish types with straight or beveled insides are available. Hand lapping hones with diamonds at either end can also be supplied.

So-Lo Makes Fix-Iron Powder For Repairing Cracks, Joints

Fix-Iron has been produced by So-Lo Works, Loveland, Ohio, for repairing broken, cracked, or defective metal castings, piping, making joints, seams and stopping leaks in boilers, furnaces, fire pots and other metal equipment. This cement can be used on iron, steel, brass and other metals as well as wood. It comes in powder form and is mixed with water. No heat is required. Application is made with a putty knife or similar tool, and may be hammered into cracked or broken parts.

After metallizing, Fix-Iron is said to possess the same expansion and contraction properties as iron. It is available in 1 and 5 lb. cans, 25 and 100 lb. kegs.

B-C Portable Lifting Table For Toolroom and Shop Use

A portable lifting table for toolroom and shop use has been produced by Barrett-Cravens Co., 3255 West 30th St., Chicago, Ill. This table is available in two sizes. Style F-1 has a table size of 28×40 in., with maximum weight capacity of 3,000 lb. Style F-2 has a table size of 24×32 in., with maximum table load capacity of 2,000 lb. Both styles are equipped with heavy-duty ball bearing casters and may be furnished with wheel brakes.

With a simple crank-up mechanism the flat top table is adjustable to heights ranging from 24 to 40 in. In addition to their uses in removing, placing and conveying dies, these tables may also be used to support and level long bars, sheets, frames and the like for fabrication.

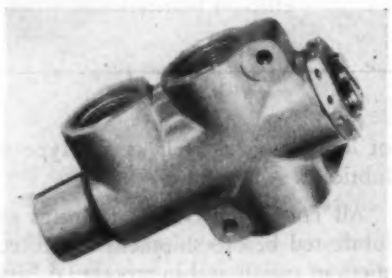
du Pont Ceramic Composition Has Non-Conductor Application

A ceramic type composition, made by E. I. du Pont de Nemours & Co., Wilmington 98, Del., produces electrically conductive coatings that may be applied to a variety of non-conductors including glass, plastics, porcelain, soapstone, wood, cloth and paper. Application to non-conducting base materials is by spraying, dipping or brushing, followed by air drying or baking.

This composition contains silver powder and produces a surface of low electrical resistance and high conductivity. Several different formulations of the material are being produced, each designed to meet the varying requirements of different base materials and degrees of adherence and film toughness. The coatings are dull, metallic gray in appearance.

American Makes Relief Valve For High Pressure Systems

American Screw Products, 7000 Avalon Blvd., Los Angeles, Calif., has designed an adjustable pressure relief valve which is particularly adapted for high pressure systems in aircraft hydraulics. This VR type valve is available in three sizes: VR-5 has



American relief valve

ports threads ¾-18, VR-6 has ports threads ⅞-18 and VR-7 has ports threads ¾-18.

The body is made of aluminum forging with an inner casing of stainless steel. Introduction of the dashpot is said to insure smooth operation and to eliminate vibration and chattering when the pressure is balanced against the spring and give maximum flow within the pressure range.

Wiremold Midget Receptacle Extends Plugmold Wiring Use

The No. 2127H two-terminal midget twist-lock receptacle has been developed by Wiremold Co., Hartford 10, Conn., for installation in No. 2100 Plugmold wiring system. The unit extends the utility of this system for applications along work benches, inspection racks, and assembly lines for plugging in hand tools, test apparatus, appliances or work lights. This receptacle is wired for 15 amp. 125 volts; 10 amp. 250 volts.

TRADE PUBLICATIONS

ABRASIVE MILLING The streamlined catalog announced by the Andrew C. Campbell Div., American Chain & Cable Co., Bridgeport 2, Conn., gives necessary data and specifications of the No. 302 Campbell Horizontal Wet Abrasive Cutting Machine.

AIRCRAFT HYDRAULIC VALVES American Screw Products, 7000 Avalon Blvd., Los Angeles 3, Calif., has issued a catalog picturing, giving specifications and engineering drawings of its aircraft hydraulic valves. Aimed at the markets of Latin America, inserts are printed in Spanish.

ATMOSPHERE UNIT Bulletin No. 90, announced by the Gas Division, American Electric Furnace Co., 27 Von Hillern St., Boston, Mass., contains concise yet complete information about the application, operation and standard sizes of the Juthe Gaskrak Atmosphere Unit.

CARBON SEAL RINGS An illustrated booklet, dealing with carbon seal rings and their application to the bellows type shaft seals, has been issued by Pure Carbon Co., St. Marys, Pa. Features are detailed with relation to specific uses.

CARBIDE TOOLS A 4-page stock tool bulletin (No. 44-1) covering its revised line of single-point, diamond-ground carbide tools has been released by Tungsten Carbide Tool Co., 2661 Joy Road, Detroit 6, Mich. Complete specifications and prices of all tools carried in stock are listed.

CHAIN DRIVE To shorten time necessary for calculating center distances and chain lengths of chain drives operating over cut-tooth wheels, Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., has computed and published a series of tables. Book No. 1991.

CHUCK The Doall Electro-magnetic chuck and the Selectron which provides DC current for chucks, demagnetizes them and varies their magnetic pull, are described in a bulletin issued by Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis 4, Minn.

CHUCKING AUTOMATICS Model RPA 4, 6 and 8 spindle chucking machines produced by The National Acme Co., 170 East 131 St., Cleveland 8, Ohio, are pictured in use in Catalog CM 43.

CINCINNATI GENERAL CATALOG The third yearly edition of general catalog M-995-2 has been issued by

S-10 UNIVERSAL HYDRAULIC Testing Machine

★ MODEL S-10-A 4,000 LB CAPACITY
★ MODEL S-10-B 10,000 LB CAPACITY
★ MODEL S-10-C 20,000 LB CAPACITY

This is a testing machine styled to the times, well designed and finished, extremely compact, low in cost, foolproof, and broad in its useful application to shop and laboratory testing.

Outstanding Features

1 Open front grips with replaceable file inserts in the wedges.

2 Gripping heads counter-balanced and spherically suspended for axial loading, but restrained against excessive tilting while operating grip handles.

3 Lateral adjustment of lower gripping head for offset of spot-welded specimen.

4 Floating type, packless hydraulic loading cylinder.

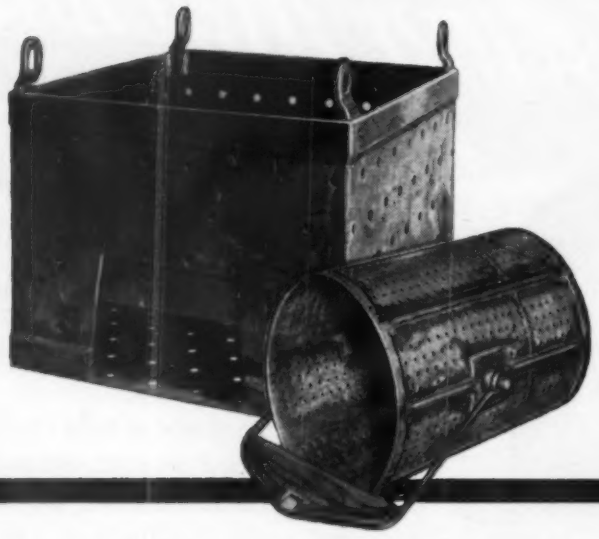
5 Quiet non-pulsating hydraulic power unit with variable fluid discharge speed control and instantly reversible direction of head motion.

Write for Bulletin 182

THE BALDWIN LOCOMOTIVE WORKS, BALDWIN SOUTHWARK DIVISION, PHILADELPHIA, PA., U.S.A. PACIFIC COAST REPRESENTATIVE: THE PELTON WATER WHEEL CO., SAN FRANCISCO, CALIF. IN CANADA: PEACOCK BROTHERS LTD., MONTREAL.

BLW THE BALDWIN GROUP **BALDWIN**
SOUTHWARK
TESTING EQUIPMENT

Are you interested in saving money on your Pickling and Heat Treating Equipment?



THIS *NEW* BOOK WILL SHOW YOU *HOW*

WRITE OR MAIL COUPON BELOW

We design and build tailor-made equipment for the pickle house from Monel, Inconel, and alloy steels. In this new catalog, we illustrate 33 different types of equipment, including baskets, crates, chains, and accessories.

WELDCO

THE YOUNGSTOWN WELDING & ENGINEERING CO.
3714 OAKWOOD AVE. YOUNGSTOWN, OHIO

Please Send Your Catalog *BY RETURN MAIL*

Name_____

Company_____

Address_____

City and State_____

Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio. Included is information on two additional machines and two pages of grinding machine attachment data.

COOLANT PUMPS Ruthman Machinery Co., 1823A Reading Road, Cincinnati 2, Ohio, has published a 60-page catalog describing, picturing and giving specifications on its various types of gusher coolant pumps.

DUPLICATING O'Neil-Irwin Manufacturing Co., Minneapolis 15, Minn., has issued Di-Acro catalog 44-6, describing and picturing the developments which have been made by that firm in the field of die-less duplicating.

DUCT A bulletin on Saflex Plug-in Duct, Saflex Feeder Duct, Square Duct and Screw Cover Duct for electrical distribution systems, has been issued by Square D Company, 6060 Rivard St., Detroit 11, Mich.

ENGINE PRODUCTION An industrial film of historic and educational value, released by The Cooper-Bessemer Corp., 2511 Terminal Tower, Cleveland, Ohio, traces the development of the firm's engine production from its beginning 110 years ago to its present position as a producer of diesel and gas engines, compressors and foundry castings.

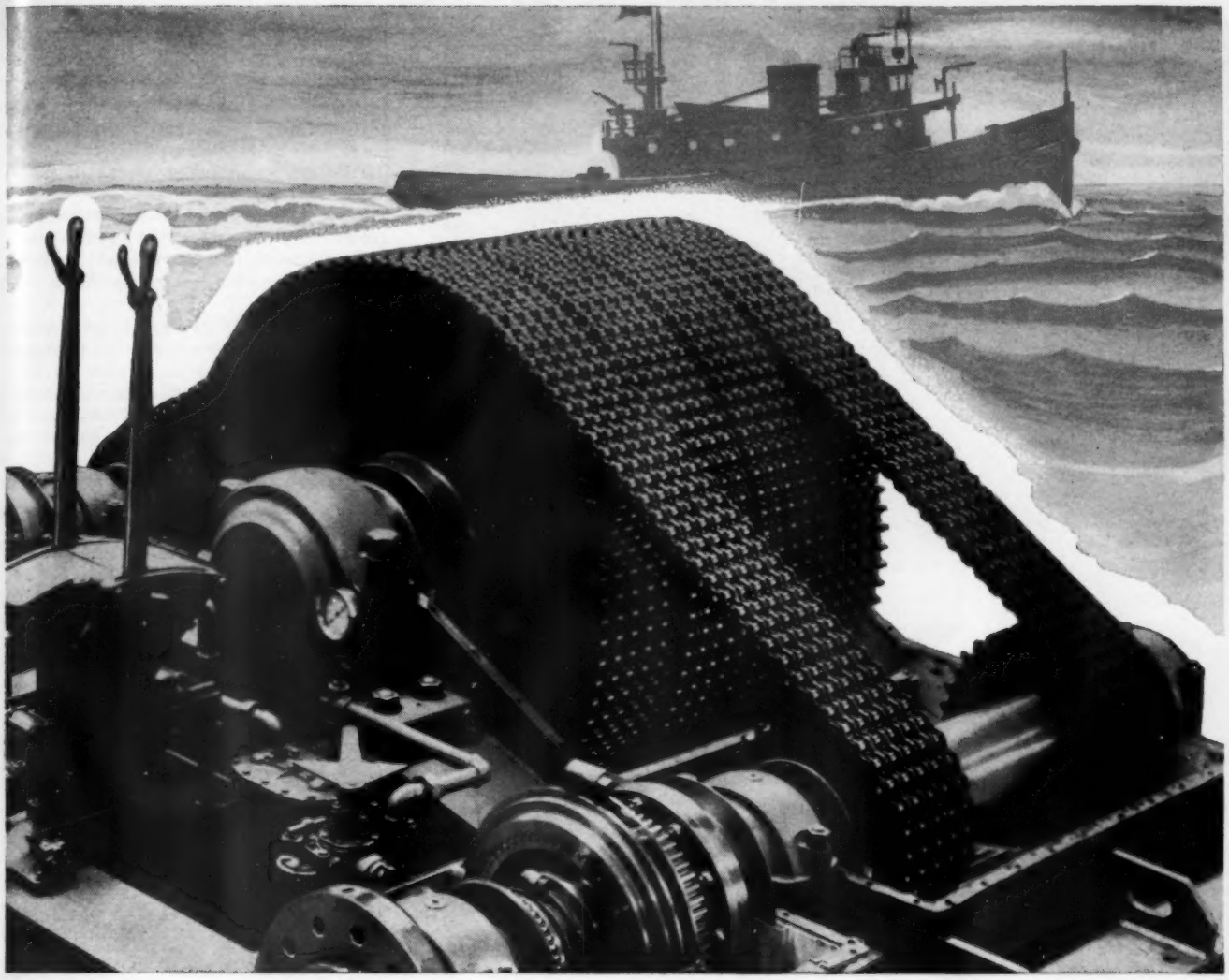
FILTER Bulletin 443 of the Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass., pictures and describes that firm's Filtaire portable dust collector.

GRINDERS AND BUFFERS Queen City Machine Tool Co., 236 E. Second St., Cincinnati 2, Ohio, has issued a 20-page catalog illustrating, specifying and pricing representative types of its line of bench, heavy-duty box-type and pedestal grinders, combination buffers and grinders, heavy-duty buffers and disc grinders. These Queen City machines have a range of 1/3 hp. to 10 hp.

GRINDING WHEEL DRESSERS Calder Manufacturing Co., 628 N. Prince St., Lancaster, Pa., has issued a broadside illustrating, describing and pricing its line of grinding wheel dressers and cutters.

HOLE PUNCHING Brochure PS of Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y., fully illustrates and describes the firm's plate set system of hole punching. Illustrations clearly set forth the steps necessary to use the system.

INDULATING VARNISHES A complete line of quality, air drying, insulating varnishes applied by brushing, dipping or spraying for use in the repair and manufacture of electrical equipment is presented in a bulletin just released by the Sterling Varnish Co., Haysville, Pittsburgh, Pa.



WHY MORSE ROLLER CHAIN WAS SELECTED TO TRANSMIT POWER ABOARD THE YT-277 AND HER SISTERS . . .

and why roller chain does a better job of transmitting power ashore or afloat

Morse Roller Chains, used to transmit the power of two 650 hp Diesels to a single propeller shaft aboard the Navy Harbor Tug YT-277, were selected because of their ability to withstand long and rough usage. Flexible, yet positive as gears, these precision chains, employed as integral parts of the reduction unit, connect sprockets from each engine drive shaft to separate sprockets on the propeller drive shaft. In this way, the advantages of driving a big propeller at slow speed are fully utilized. Too, the use of long-lasting Morse Roller Chain eliminates the need for much maintenance; and, since they can't slip, they deliver high power loads without power loss.

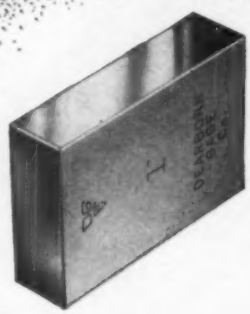
Mobile Power Plants Ashore Ashore and afloat, specially designed Morse Dual Drive Units employing Morse Precision Roller Chain, Morse Couplings and Morse Clutches, are used for multi-engine power transmission to a single shaft. Available as *complete* self-contained units, they are automatic-control equipped to operate one or more engines as power demands require. Mounted on rail cars or trucks, with engines, they make ideal mobile power units—that are going places in the lumbering industry, the oil field, and, soon, in your field.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N. Y. • DETROIT, MICH. • A BORG-WARNER INDUSTRY

PROMPT DELIVERY ON GAGE BLOCKS



PROMPT DELIVERY can now be made on most Dearborn Gage Block W or Working Sets. These gage sets have a guaranteed tolerance of ± .000008 inch or fraction thereof. Their gaging surfaces are all chromium plated (an exclusive feature) for longer wear. Wire your order today or contact your nearest Dearborn Distributor.

W Or "Working Sets"
"W" accuracy is a guaranteed tolerance of ± .000008 inch per inch, or fraction thereof, of gage.

I Or "Inspection Sets"
"I" accuracy is a guaranteed tolerance of ±.000004 inch per inch, or fraction thereof, of gage.

L Or "Laboratory Sets"
"L" accuracy is a guaranteed tolerance of ± .000002 inch per inch, or fraction thereof, of gage.

DEARBORN GAGE CO. 22038 BEECH STREET DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks

INSPECTION This new handbook on scientific inspection, announced by Continental Machines, Inc., 1301 Washington Ave. S., Minneapolis, Minn., contains 64 pages of information valuable to any plant inspection department. Besides descriptive material, the book also includes dozens of photos, diagrams, charts and tables. At the end of the book is a question-and-answer section which the reader may use to check the knowledge he has gained by reading the handbook.

LATHES Model PW-20 pedestal type chucking lathe for alternating current ball bearing motor headstock is described, and its specifications given in a catalog section, bulletin D-19, issued by J. G. Blount Co., Everett 49, Mass.

LOCK WASHERS Folder No. 101, released by Eaton Manufacturing Co., Reliance Div., Massillon, Ohio, contains helpful information for engineers and purchasing agents on Eaton Springtite Semblies, a preassembled lock washer.

LOCKING SYSTEM Bardwell & McAlister, Inc., P.O. Box 1310, Hollywood 28, Calif., is offering a pocket-sized installation manual on the Rosán Locking System for Rosán Locked-in Studs and Threaded Inserts. Fully illustrated, this booklet features the latest applications to problems of fastening and sealing.

MANPOWER A shop and office bulletin board poster, 8½ x 11 in., urging industry's "Soldiers of Industry" to save ten minutes per day to roll up a total of 1,666,666 man-hours saved daily for the production of more fighting equipment, is available from Bound Brook Oil-Less Bearing Co., Bound Brook, N. J., in quantities to post throughout a plant.

MATERIAL HANDLING EQUIPMENT A 6-page edition (second edition) of a new industrial handling equipment catalog has been released by H. L. Pitcher Co., exclusive sales agents for the Rose Manufacturing Co., 12400 Strathmoor, Detroit 27, Mich. Included are automatic dump hoppers on casters, heavy duty (wagon type) trucks, and miscellaneous steel boxes, baskets and platform skids, truck trailers and specific purpose trucks.

METAL CLEANING Oakite Compound 86, just released from war production uses, and now available for providing improved adhesion in the organic finishing of steel parts, is the subject of a special service report prepared by Oakite Products, Inc., 57 Thames St., New York 6, N. Y.

MICRO SWITCHES A color and sound 16 mm. motion picture, running 40 min., "Uses Unlimited," has been released by Micro Switch Corp., Freeport, Ill. It features fighting micro switches in ships, planes, tanks, trains

and motor vehicles and in the control of weapons and equipment.

NEUTRAL BATHS Bulletin 110 published by The A. F. Holden Co., New Haven 8, Conn., contains pictures and descriptions of installations of Holden neutral baths for hardening and tempering.

OIL AND GREASE ABSORBENT A kit of pamphlets, descriptive material and reproduced pertinent letters dealing with Speed-Dri oil and grease absorbent is available from Refiners Lubricating Co., 601 West 26th St., New York, N. Y.

PICKLING The Enthone Co., 442 Elm St., New Haven 2, Conn., has released a folder giving complete information on the Enthone Acid Addition Agent—what it is, its uses and complete directions on how to use it.

PLATING A fully-illustrated brochure giving complete data on "Multi-Edge" Lead Anodes for chromium plating is offered by The Enthone Co., 442 Elm St., New Haven 2, Conn. Also included are drawings of eight different types of hooks, and instructions for ordering.

PRECISION PRODUCTS The 1944 Mallory Catalog of Approved Precision Products is available through Mallory Distributors or by writing directly to P. R. Mallory & Co., Inc., 3029 East Washington St., Indianapolis 6, Ind. Completely indexed and illustrated, it includes the entire line of Mallory radio, electrical and electronic parts with sizes, dimensions and rated capacities, together with list prices.

PRECISION TOOLS The Van Keuren Co., 176 Waltham Street, Watertown, Mass., has published its new catalog and handbook, No. 32. The 144 pages of illustrated and descriptive material are given to engineering formulae, data, and tables pertaining to precision measurements of screw threads, worms, gears, dovetails, splines and other precision products.

PRESSES Four new bulletins may be obtained from the Hydraulic Press Mfg. Co., Mount Gilead, Ohio: No. 4026 on H-P-M FASTRAVERSE metal working presses No. 4307 on process presses; No. 4400 describing the operating and control system of the H-P-M FASTRAVERSE press; No. 430 outlining briefly HYDRO-POWER hydraulic pumps, controls, valves, power units, cylinder and ram assemblies, and tube fittings.

PUMPS The Pioneer Pump & Mfg. Co., 19679 John R St., Detroit 3, Mich., offers an 88-page Pump Engineering Manual, designed as a reference book for machine tool builders and pump users. In addition to covering the company's line of pumps, this illustrated catalog tells how to determine the size of pumps, how to make proper pump

Woody Spencer says:
"Maximum production efficiency and service life can be realized from taps only if they are properly selected for each particular tapping operation. If you have a problem in tap-selection contact us. We frequently make recommendations from customers' blueprints."
The Wood & Spencer Company
Cleveland 3, Ohio

Standard Conveyors Synchronize Production All "Along the Line"

WORK in process is quickly shunted from one machine line to the next in this effective Standard Conveyor installation. The transfer table in the foreground consisting of a section of roller conveyor mounted on wheels, provides quick easy means of shifting the work-pieces from one line of roller conveyor to another. Two machine lines are thus continuously fed with work — without halt or interruption and with a minimum of manual handling.

Knowing how to apply power and gravity conveyors to best advantage is equally as important as building them well. An experience record of more than 35 years, serving all classes of industry and business, qualifies Standard Conveyor to be of service to you.

Write for valuable reference book—"Conveyors by Standard" — Catalog No. AM-34.

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STANDARD CONVEYOR COMPANY
General Offices:
NORTH ST. PAUL, MINNESOTA
Sales and Service in All Principal Cities

STANDARD
Gravity and Power
CONVEYORS

★ ENGINEERED FOR FASTER PRODUCTION ★

installations, and gives complete information on determining pump capacity requirements. Requests must be made on company stationery.

RADIAL DRILLS The "American" hole Wizard is discussed in Bulletin No. 315 just released by The American Tool Works Co., Cincinnati, O. Each feature of this drill is separately illustrated and described. A handy specification chart is included giving operational data for various size radials. The company also offers Bulletin 458 which presents a new technique in boring and drilling, employing the use of the radial drill as a boring machine.

RIVETING TOOLS Emerson Engineering Co., 1418 S. Flower St., Los Angeles 15, Calif., offers a new catalog on riveting tools and equipment. Completely illustrated and divided into sections, it is indexed for ready reference and contains sections on Rivet Sets, Squeezer Sets, Dimpling Tools and many other general riveting topics.

SHEAVE Bulletin B6310 of Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis., presents pictures and concise details of its Magic-Grip sheave. The pictorial sequence demonstrates the put on-take off operation for the sheave, while a sketch presents a mechanical explanation of how it is locked to the shaft to provide smooth-running performance.

STEELPLATE W. J. Holliday & Co., Hammond, Ind., has issued a bulletin dealing with the use of Speed Case and Speed Treat carbon steels for machine molding and die fabricating. Requests should be on company letterheads.

STEEL A simplified complete steel price list that contains all of the data required to determine or check prices of steel purchased from warehouse stocks, is offered free to all steel users by the Earl M. Jorgensen Co., Los Angeles and Oakland, Calif. and Houston, Texas.

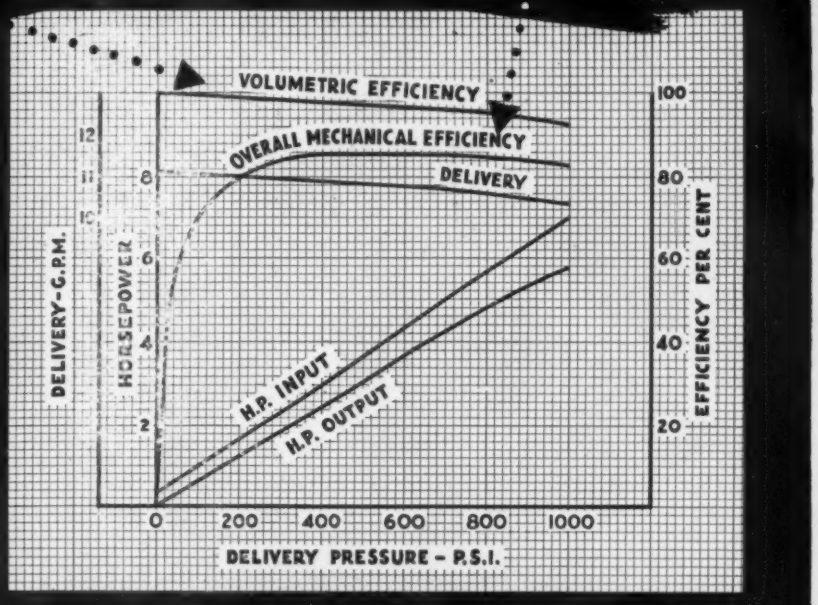
STELLITE TOOLS "Operating Information on Stellite 98M2 Cobalt-Chromium-Tungsten Turning and Boring Tools and Milling Cutters" is the title and subject of a booklet offered by Haynes Stellite Co., Union Carbide and Carbon Corp., 30 E. 42 St., New York, N. Y.

STOCK RECORD A stock record in folder form has been issued by Manufacturers Screw Products, 216-222 W. Hubbard St., Chicago 10, Ill. It is a periodical record of "in-stock" aviation and commercial fasteners of every type and description.

TOOL HARDENING The Perfection Tool & Metal Heat Treating Co., 1740 West Hubbard St., Chicago, Ill., has issued a circular on its "Nusite" process of hardening high-speed steel. "Silver Finish" hardening and "Deep-

HIGHER VOLUMETRIC EFFICIENCY...

HIGHER MECHANICAL EFFICIENCY...



Typical curves shown are for V-104-D pump at 1200 rpm; curves for other models are similar. Above curves are for oil having viscosity of 150 S.S.U. at 100° F., temperature of 120° F.

VICKERS
BALANCED Vane Type PUMPS

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

These performance curves merit careful consideration when selecting constant delivery pumps for oil hydraulic power and control systems. The overall mechanical efficiency is extremely high throughout the important working pressure range. Note that pump delivery and efficiency are not reduced appreciably as pressure is increased. These features, together with the 1000 psi continuous working pressure that is possible, effect an important reduction in pump size and cost. This higher working pressure also means a substantial saving in first cost and in space occupied by cylinders, valves, piping, tank, etc. for a given speed and power.

Other important advantages of Vickers Balanced Vane Type Pumps include: (1) Hydraulic Balance which cancels out bearing loads and means much longer pump life, (2) cartridge assembly contains all pumping parts that move and is important to the simplicity, easy inspection and minimum maintenance of these pumps, (3) compact, yet rugged, (4) automatic wear take-up, (5) temperature adaptability, etc. Ask for Bulletin 40-25a for all the facts about Vickers Balanced Vane Type Pumps.

Vickers Application Engineers will gladly discuss with you how Vickers Pumps and Vickers Hydromotive Controls can be used to advantage.

VICKERS Incorporated

1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCKFORD • TULSA • WORCESTER

Positive Identification for Ryerson Alloys

Confirms Quality...Prevents Shop Errors

Immediate Shipment from Stock

Each bar of alloy steel in Ryerson stock is painted on the end to indicate the type of alloy—then stamped on the side near the end with the number of the heat from which the bar was rolled. Smaller size bars are bundled and tagged with similar identification.

This is important because it offers you an unmistakable means of verifying the analysis of the alloy steel you receive from Ryerson. Heat number and color marking are also recorded on the Ryerson Alloy Steel Report that is furnished with each alloy shipment. This Report contains accurate data on the analysis, working temperatures and heat treatment response for quenched and drawn 1, 2, 3 and 4 inch rounds of your steel. This gives you reliable information for heat treatment that will produce the desired result.

The unique and valuable Ryerson alloy service is one of many reasons why it will pay you to concentrate your steel purchases with us.

Joseph T. Ryerson & Son, Inc., Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Pittsburgh, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

freezing" process are also described in the circular.

VALVE SELECTION CHART A chart on heavy 11½ x 17 in. cardboard, issued by Reading-Pratt & Cady Division of American Chain & Cable Co., Dept. S.P., Bridgeport, Conn., is designed to expedite the selection of the proper valve.

V-BELT DRIVES A 44-page bulletin (B6249) describing its complete line of fractional horsepower Texrope V-belts and sheaves has been released by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

WAGE INCENTIVES Consolidated Management Consultants, 521 Fifth Ave., New York 17, N. Y., has issued a 48-page "guide to increased production without extra manpower" through use of wage incentive plans.

WELDING The metallic arc welding of tools and dies is presented on two sound slide films and their accompanying records, prepared by Welding Equipment & Supply Co., 227 Leib St., Detroit, Mich.

NEW BOOKS

SYMPOSIUM ON POWDER METTALLURGY. *Published by the American Society for Testing Materials, 260 South Broad St., Philadelphia 2, Pa. $1.*

The seven technical papers and extensive discussions comprising the symposium on powder metallurgy, a symposium on powder metallurgy presented at the 1943 Spring Meeting of the American Society for Testing Materials have been published in a 55-page, paper-bound booklet. Included are papers on fundamentals necessary to apply powder metallurgy, a discussion on effect of pressure on the properties of compacts and one on the effect of particle size. There is also a discussion on alloy powders, metal powder friction materials and hot pressing of metal powders. Another discussion covers the influence of homogenization upon the physical properties of copper-nickel powder alloys.

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THE THERMODYNAMICS OF FIRE ARMS—*By Clark Shove Robinson, department of chemical engineering, Massachusetts Institute of Technology. 175 pages. Published by the McGraw-Hill Publishing Company, 330 West 42 Street, New York 18, N. Y. $2.50.*

Guns today are making history on the battlefields of the world. Their rumbling means so much in human values that one is likely to overlook the hard engineering principles upon which their successful operation rests.

This book is written under the re-

strictions of wartime censorship. Therefore, many of the newer findings arising from the present conflict are not to be found in it. The author frankly states that there is nothing in his volume that has not appeared somewhere, sometime, before. He does say, however, that there is no equivalent work to be found in the English language.

Since a gun is a heat engine used to convert exploding powder to mechanical energy, it is subject to the laws of thermodynamics. Consequently, Colonel Robinson begins his book with a basic review of thermodynamic principles. This leads him into a study of ballastics, the art of hurling a projectile, and he shows that two branches of the subject, interior and exterior ballastics, can be considered separately.

The mechanical features of gun design, usually called ordnance engineering, must be correlated with the subject of ammunition manufacture in order to obtain a well-balanced consideration of the desired results. The volume is technical, but it is so written that students trained in engineering courses can use it to advantage, even though they have not had previous training in electrodynamics.

TO THE EDITOR

Would Create Standby Plants

DEAR SIR:

Only by being prepared for instant action can we escape another world war in shorter time than elapsed between the first and the second. In this respect, the suggestion of Under Secretary of the Navy James Forrestal, that most of our war plants be conserved for the next emergency is a valuable one.

I would suggest that we take all of the large government-built and equipped plants and maintain them as arsenals. Then we would always be sure of having facilities to start up almost instantly, unlike our present emergency when it took about one and one-half years to get started.

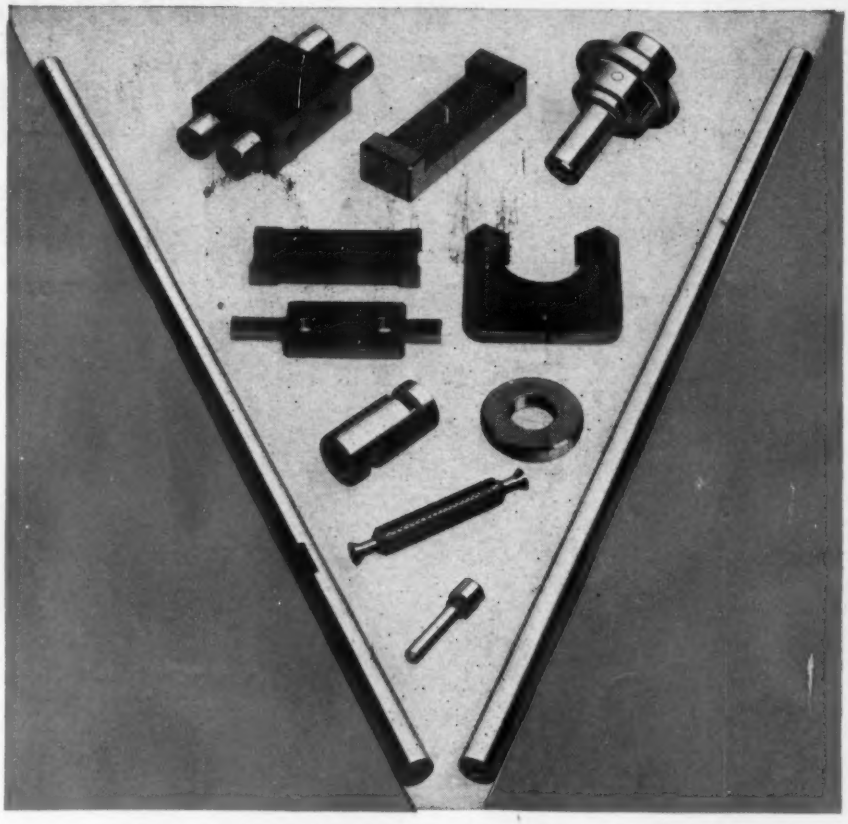
These many well-equipped plants would act about the same as an insurance policy; every nation knowing we were ready to start at any time would hesitate a long while before becoming involved.

The many other plants and machines bought by Defense Plant Corporation may be disposed of to schools and to some of the less industrialized countries on an exchange basis.

The disposition of these machines could be facilitated by exempting the purchase of more modern equipment of every kind from taxation, by allowing the total amount to be deducted in the year of purchase.

GEORGE LANGEN, *vice president, The Cincinnati Planer Company*

★ FOR VICTORY YOU NEED VOLUME . .



★ . . FOR VOLUME YOU NEED A VARIETY OF GAUGES TO CHECK YOUR PARTICULAR JOBS

Now more than ever before, industry is confronted with the problem of working to closer tolerances, that is why each operation must be checked carefully before it is allowed to pass along the production line. That is also why most manufacturers recognize the importance of using a variety of precision made gauges to speed up these inspections—and that is why manufacturers are using Turner's Precision made gauges, because they know they can rely upon them for checking closer tolerances.

★ *Send for literature on gauges that Turner makes.* ★

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY
2625 HILTON ROAD • • FERNDALE, MICHIGAN

Production Executives agree:

"No Reconversion from American Phillips Screw-Driving

. . . from now on we'll need that Speed and Cost-Control more than ever before"

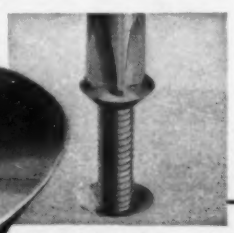
There's one sure thing in the plans of modern war plant executives . . . they'll never go back to the slow, slip-and-slash, high cost method of assembly with old-fashioned slotted head screws. They'll hold the gains they've made with American Phillips Screws which average better than 50% in assembly time, plus the elimination of rejected work and spoiled materials, thanks to the automatic alignment of the 4-winged Phillips Driver that stays with the tapered recess until the screw has been set up straight and tight.

A comparison of the cost of driving Phillips and Slotted Head Screws will show that it actually costs less to have the advantages of the Phillips Recess.

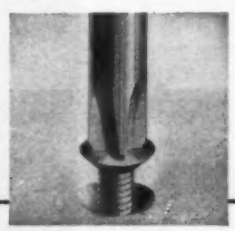
American brand of Phillips Recessed Head Screws are made under rigid laboratory check, and a unique system of piece inspection. Delivery service is maintained by high speed production. And engineering service is at *your* service on any special fastening problem.

AMERICAN SCREW COMPANY
PROVIDENCE, RHODE ISLAND
Chicago: 589 E. Illinois Street *Detroit:* 502 Stephenson Building

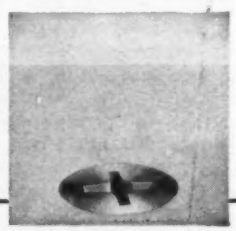
ONLY PHILLIPS SCREWS HAVE THE ENGINEERED TAPERED RECESS



1. **Fast Starting**—Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.



2. **Faster Driving**—Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)



3. **Better Fastenings**—Screws are set up uniformly tight, without burring or breaking heads. A stronger, neater job results and there are no gouges on work-surface.

Put the Screws on the Axis ★ BUY WAR BONDS

VEELOS

ENDS MACHINE TEAR-DOWN!

1 Roll for All Belt Lengths!
1 Tension for All Strands!

WHEN this C. B. & W. press was first installed over eighteen months ago, it was equipped with an 8-strand, "C" size Veelos V-belt drive. Ever since, this belt has been *driven continuously sixteen hours a day, six days a week.* Starting torque is high . . . loads are steady. But the original Veelos V-belts are still going strong!

In this same plant, Veelos V-belts are also used on fans, compressors, presses, pumps, screws and rotary kiln. The plant engineer, where these drives are installed, gives these three reasons for specifying Veelos:

1. One roll provides all belt lengths. From a single roll of Veelos, you simply uncouple any desired length of belt . . . and you do it in less than a minute! A big saving in storage space results.

2. One tension maintained on all strands. With Veelos, control of tension on each strand assures uniform, controlled tension in the entire drive! It's the *adjustable* V-belt!

3. Machine tear-down eliminated. Belts on machines with outboard bearings can be repaired and replaced without dismantling the machine—when the drive is Veelos.

These are three of the dozen important reasons for specifying Veelos on all V-belt drives. The other nine? You'll find them in your *free*, 8-page illustrated Veelos manual. Write today for this guide to peak production driving.

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

Link Construction
Ups Production

VEELOS
THE LINK
V-BELT
ADJUSTABLE TO ANY LENGTH
ADAPTABLE TO ANY DRIVE

Which RECESSED HEAD SCREW DOES THE AVIATION INDUSTRY *Okay?*

IT'S PHILLIPS

THE ENGINEERED RECESS

IT'S GOT TO BE RIGHT! The aviation industry knows its engineering . . . knows the answers to production efficiency. That's why most of the leaders in this industry selected the PHILLIPS Recessed Head.

You'll choose the Phillips Recess, too, once you study its exclusive design. You'll appreciate the scientific engineering that makes it so successful. You'll discover that every angle, every dimension has a purpose – is important to screw driving efficiency and screw strength. You'll agree there's nothing like it!

To end the screw driving troubles that slow down production and shove up assembly costs, specify screws with the Phillips Recessed Head. You can get them in any head style, type or size.

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

FASTER STARTING: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

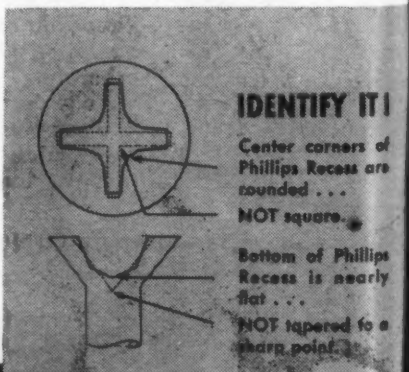
FASTER DRIVING: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

EASIER DRIVING: Turning power is fully utilized. Workers maintain speed without tiring.

BETTER FASTENING: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF TAPPING SCREWS · STOVE BOLTS



IDENTIFY IT!

Center corners of Phillips Recess are rounded . . .

NOT square.

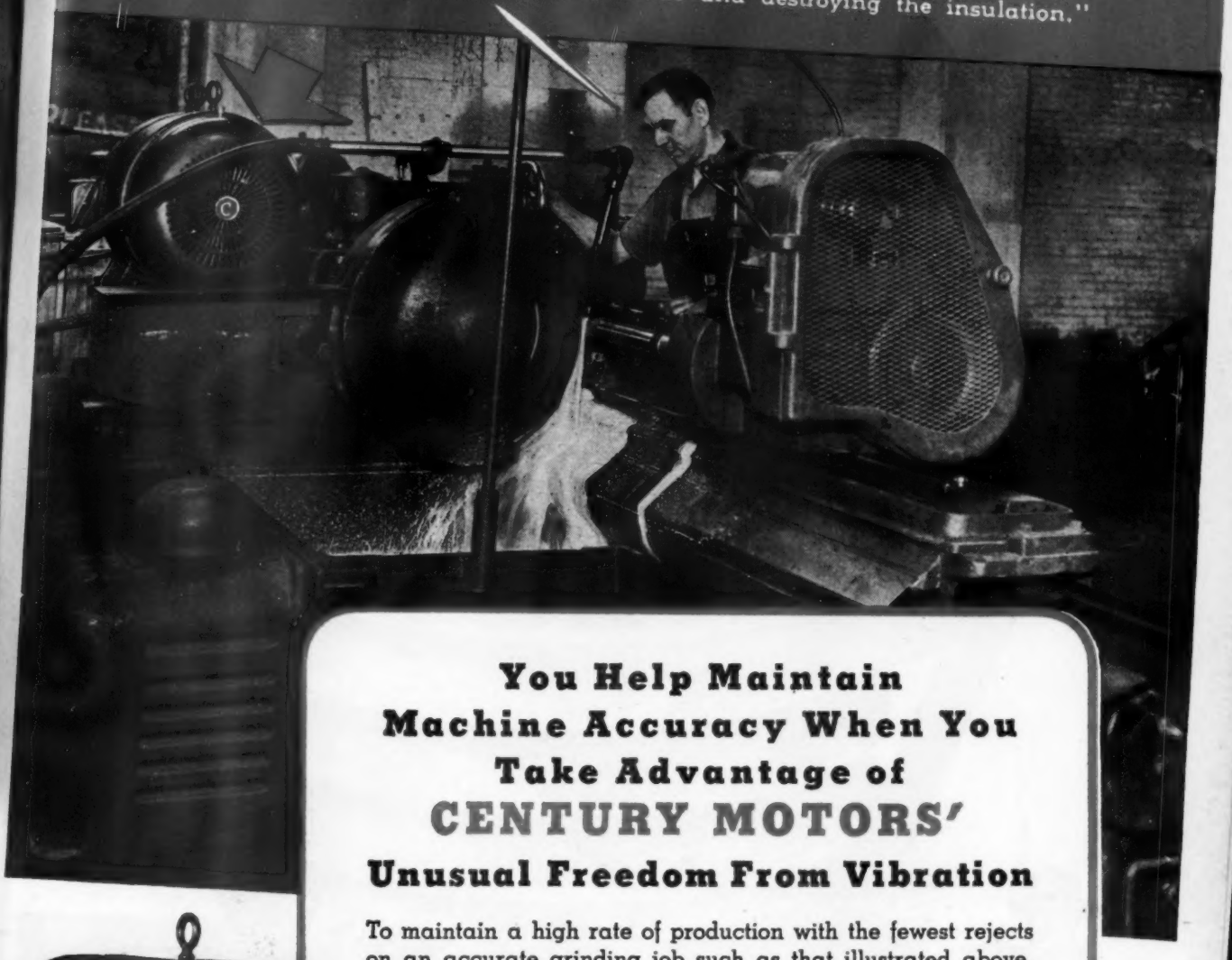
Bottom of Phillips Recess is nearly flat . . .

NOT tapered to a sharp point.

23 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Phoell Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

"There are two good reasons why that Century Motor helps me on my job — First, it helps the grinder to run smoother and I get out more pieces with less rejects. Second, I don't worry about metallic dust, coolant mist or solution getting inside and destroying the insulation."



You Help Maintain Machine Accuracy When You Take Advantage of CENTURY MOTORS'

Unusual Freedom From Vibration

To maintain a high rate of production with the fewest rejects on an accurate grinding job such as that illustrated above, two major conditions must be met. Certainly there are other considerations, but watch for these two basic points —

1. **The motor must be smooth starting and running so that it will not transmit appreciable vibration to the machine.**
2. **The frame construction must protect the motor from the hazards of surrounding atmospheres.**

These two major considerations, plus many others, were considered by the Century engineers who recommended the Century motor for the application shown here, as well as for many thousands of others.

Call in a Century engineer to assist you with your electric motor application problems. His experience and advice may prove valuable to you.

1/20 to 600 horsepower

CENTURY ELECTRIC COMPANY, 1806 Pine St., St. Louis 3, Mo.

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Operating strictly on the offensive, the "Unbrako" Hollow-Set Screw with the knurled point has vibration licked at the start. Applied in the usual manner, the KNURLS dig in and the "Unbrako" hangs on with a grip that can't be shaken off no matter how hard the machinery vibrates, though in action day and night . . . There's a vast army of these "Unbrako" Self-Lockers on duty in war plants all over the country and in thousands of machines, tools and implements rolling off production lines—keeping maintenance costs and worries down by infallibly holding parts together under any and all conditions. And they're good for many "engagements" because they're easily removed with a wrench—can be re-used any number of times.

Sizes: No. 4 to 1½" diameter

Get the "Unbrako" catalog

Knurling of Socket Screws originated with "Unbrako" years ago.

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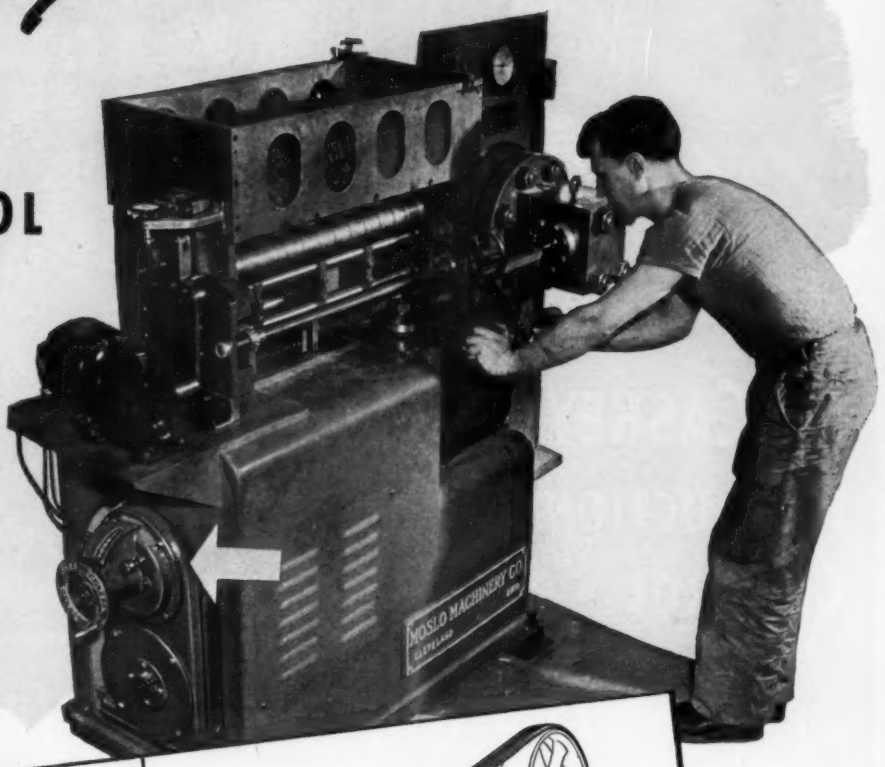

The definite preference of plant superintendents, machine shop foremen, expediters and operators for REEVES Variable Speed Control is not hard to understand. No other speed control is so flexible, so infinitely variable, so positive and dependable in operation. No other offers so many types and sizes of units to meet every installation requirement. Get full information from Catalog offered below.

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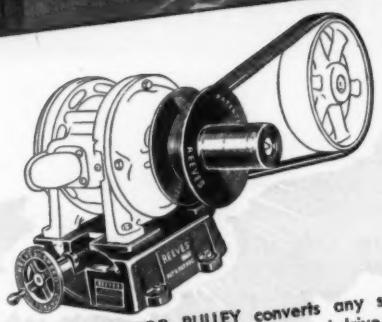
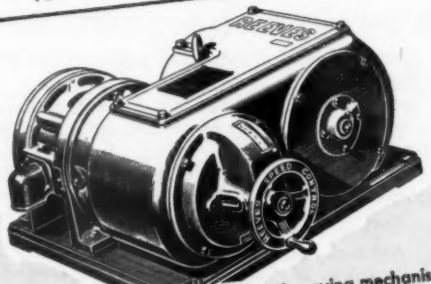


VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive. Sizes to 15 h.p. Speed variation within 4:1 ratio.



MOTODRIVE combines motor, speed varying mechanism, reduction gears in one compact unit. Sizes to 15 h.p. Speed variation 2:1 through 6:1.

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NEW CATALOG

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. . . Tool crib control assuring more production with less tools.

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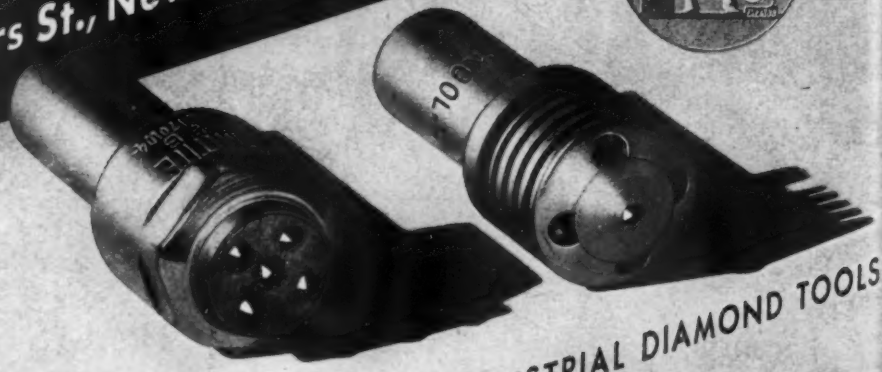

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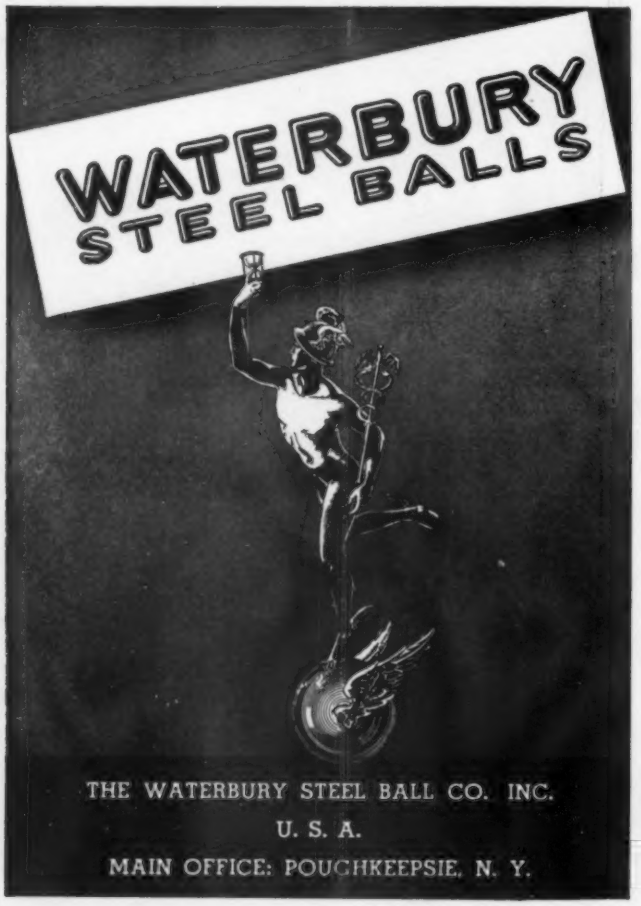

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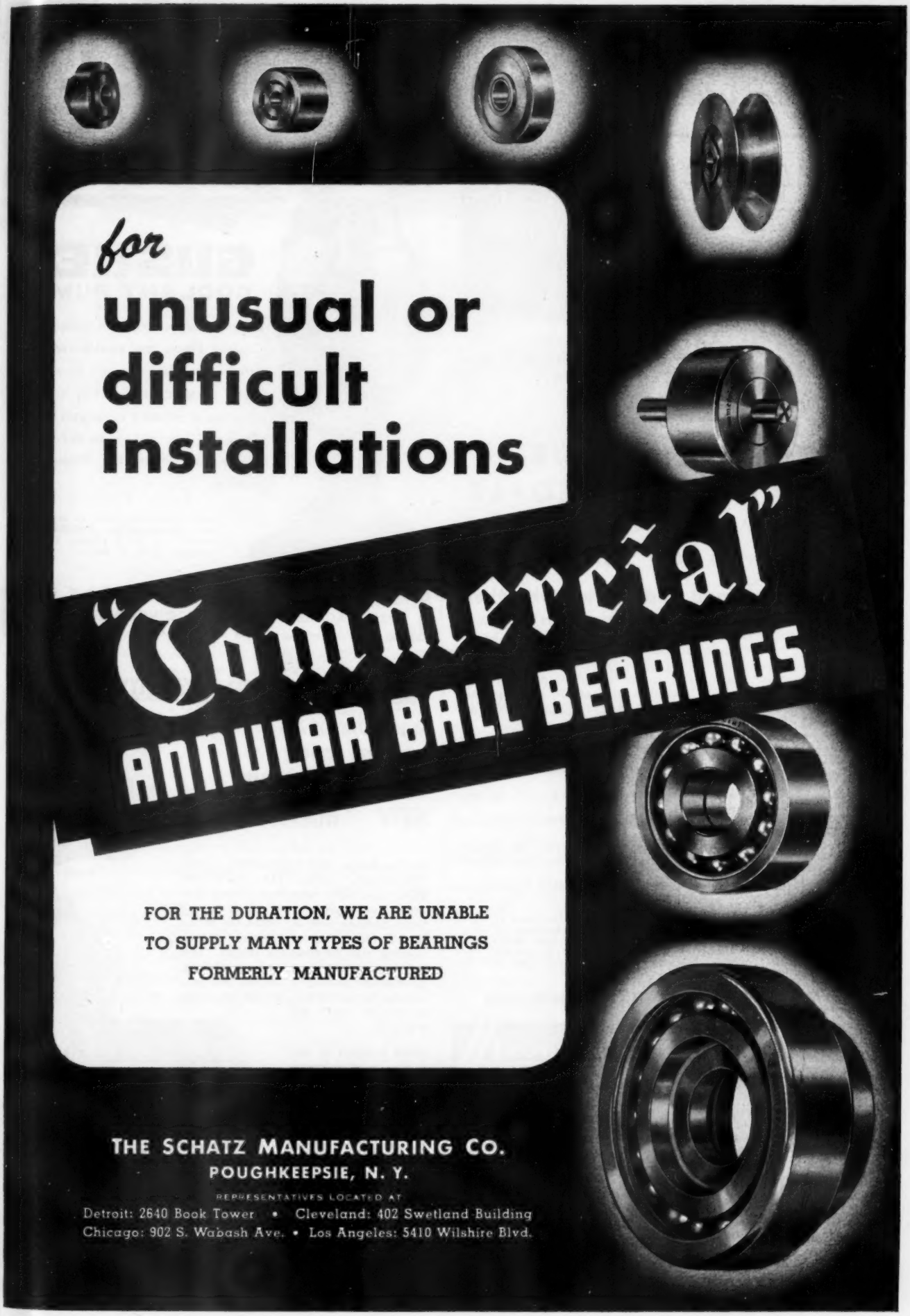
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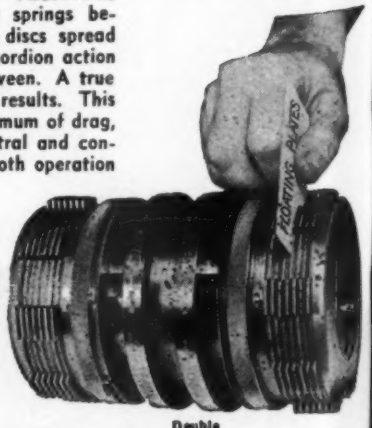

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Other features of performance and operation include simple manual adjustment, sensitive starting, safety and quietness. Heat and abrasion, ordinarily inherent in many clutches of the multiple disc type are eliminated in the "MAXITORQ."

Send for dimension sheets and specifications covering the sizes and types available.

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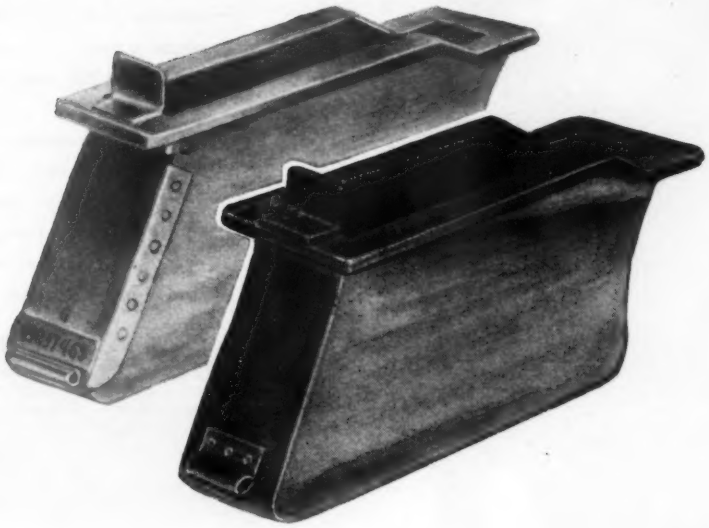

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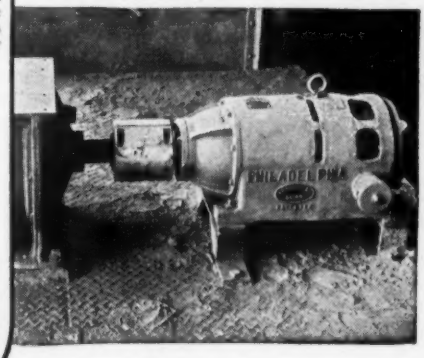

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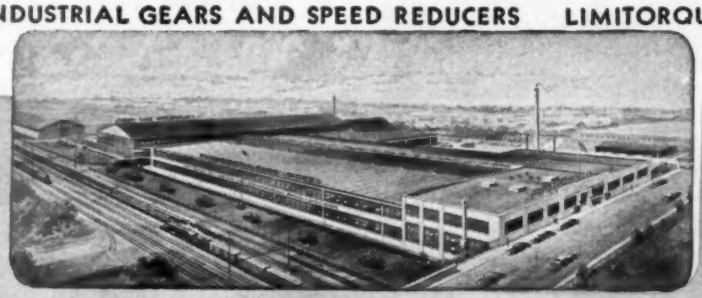

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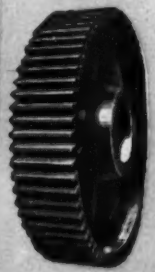

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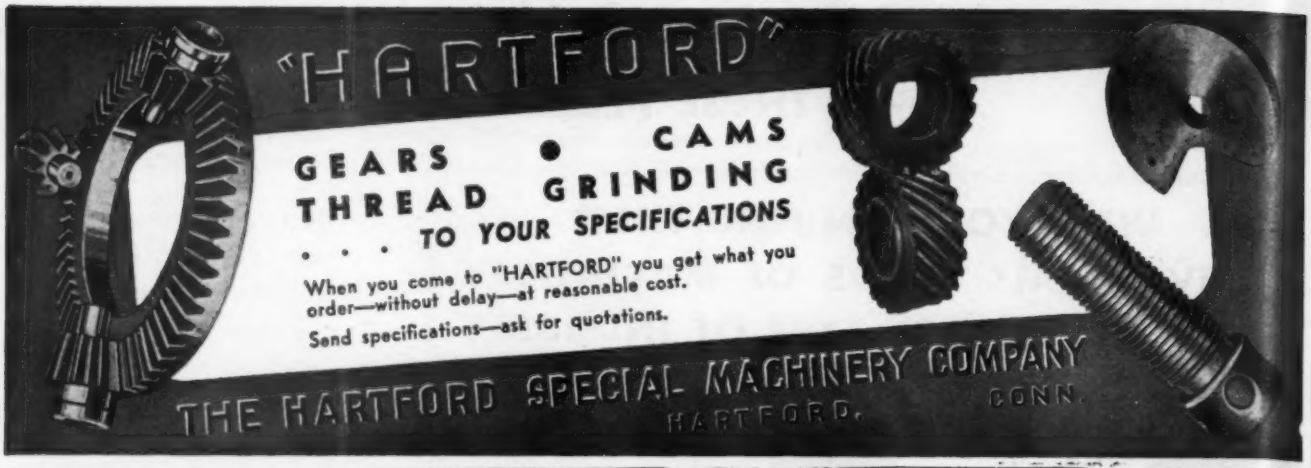
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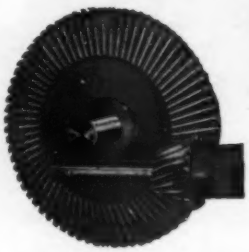

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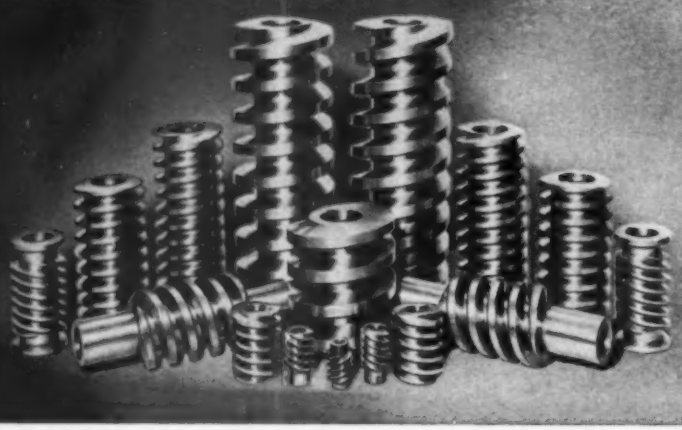

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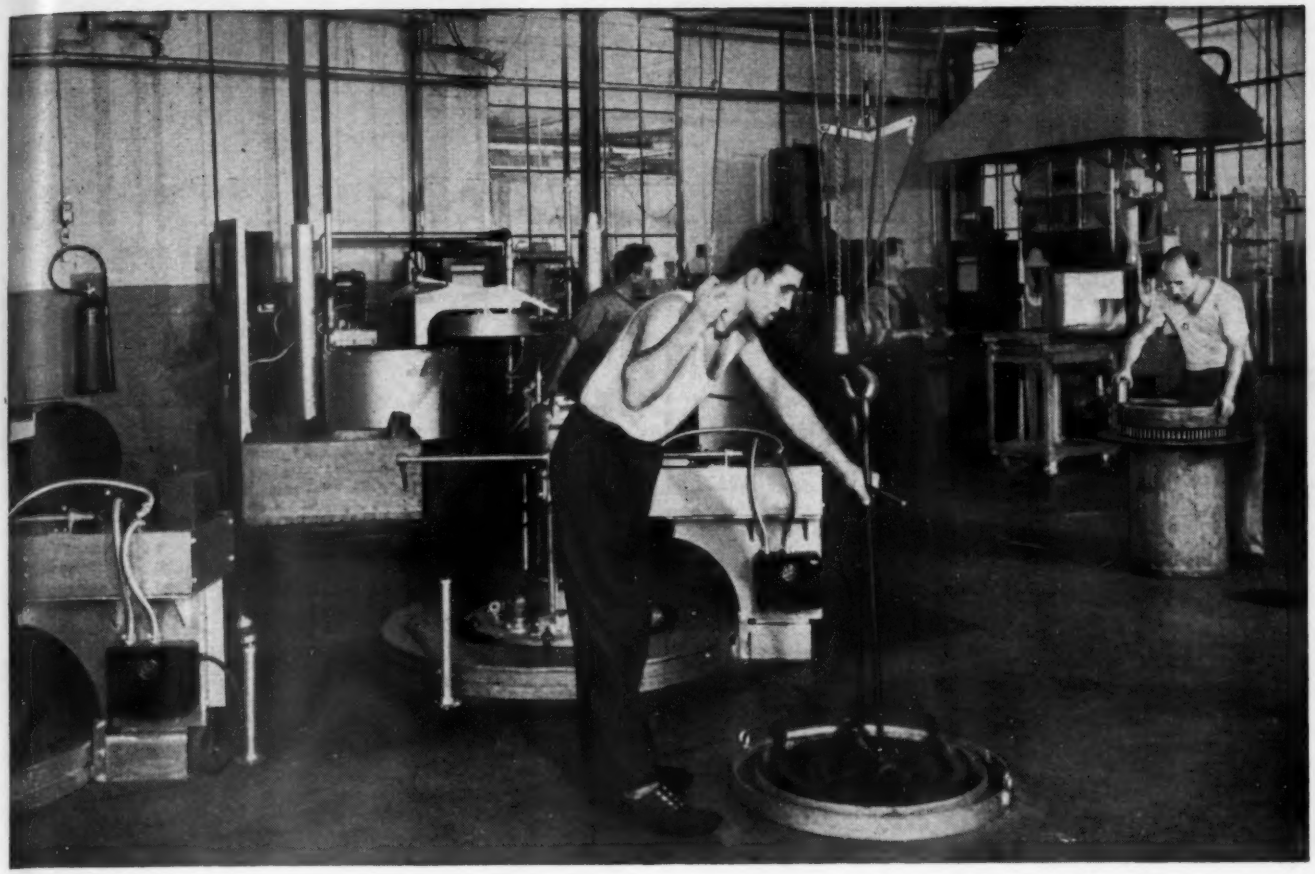
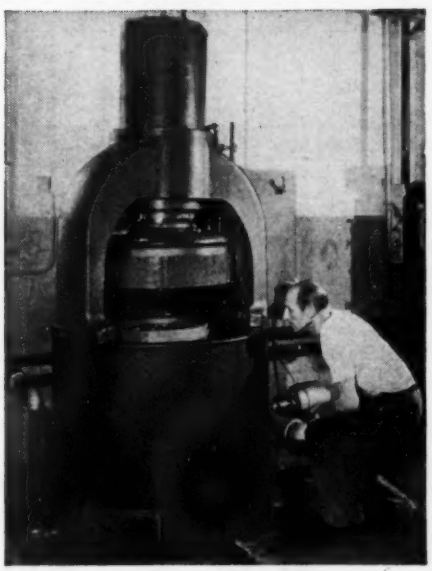


Precision Heat Treating of SIER-BATH PRECISION GEARS



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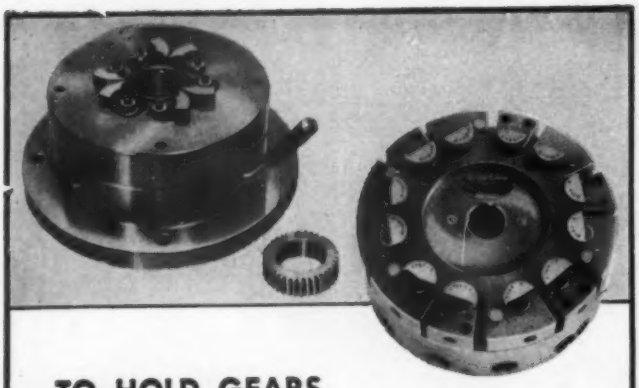

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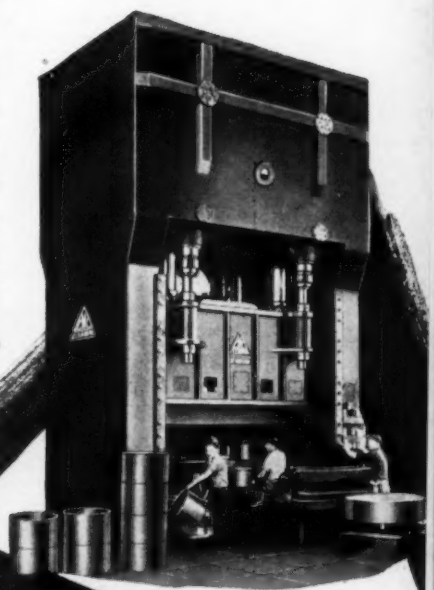

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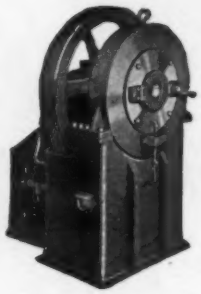

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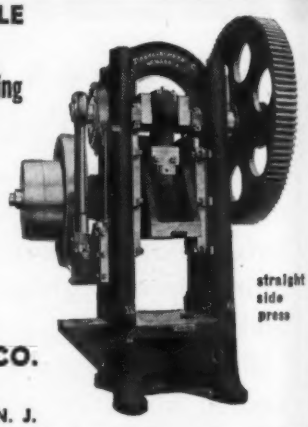

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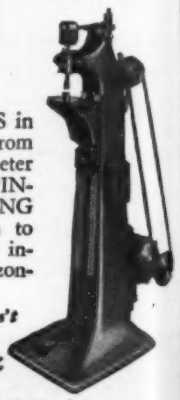

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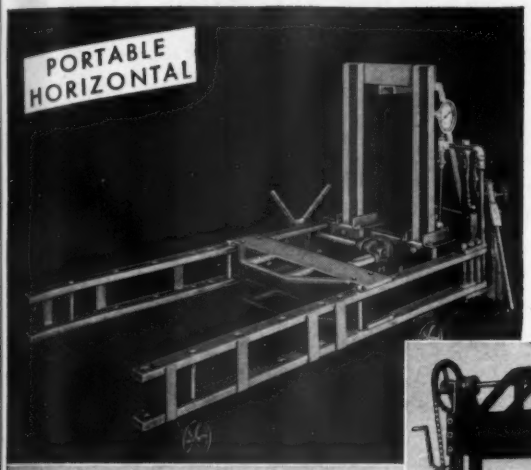
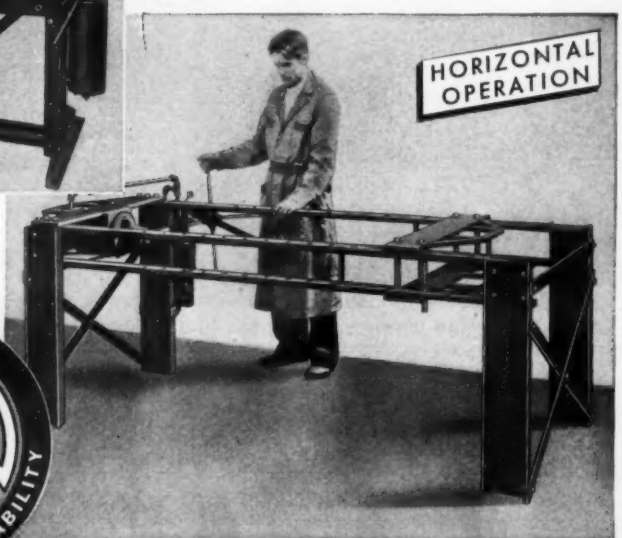


It took War's demands for speed and more speed to demonstrate the unusual versatility and adaptability of the KRW Hydraulic Arbor Press. In many cases, when other equipment was not immediately obtainable, we were called on to adapt our hydraulic arbor presses to save the day productionwise. Illustrated here are some of the results that have been achieved. All of these special presses incorporate the time-proven features of the standard KRW Hydraulic Arbor presses. They are now available...*BUILT TO ORDER*... for *2 to 3 week delivery* on all orders carrying a priority of AA-4 or better. If you have a problem that a special design press might solve, call us now. Write for our new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacities.



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We can't tell you what he is going to handle. That's a military secret. But we can reveal his specifications and features, listed below. They typify the thoroughness and versatility designed into all Elmes hydraulic equipment.

Several weeks ago he was in the embryonic stage—on the drawing board in our engineering department. We were told that a specific metal part had to be produced. Could we construct a press to do it? Specifications were calculated; drawings were made, checked and rechecked until Elmes engineers, in consultation with client's engineers, were sure that all details were perfect. Production was started, assembly made and tested. Mr. Hush-Hush passed all tests, as all Elmes equipment must, and now is going into the front line of production. He will, we know, give a good account of himself.

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Here is *another* important war job on which ETNA Swaging Machines are demonstrating their ability to produce close-tolerance work . . . in volume lots . . . at reduced cost.

The operation illustrated is the swaging of copper bands around 20 mm. shell cases . . . a vital part in the mass production of this type armament.

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Frequently eliminating two and three machining operations.

Improving the metal-structure by making it stronger, harder, more dense and more elastic.

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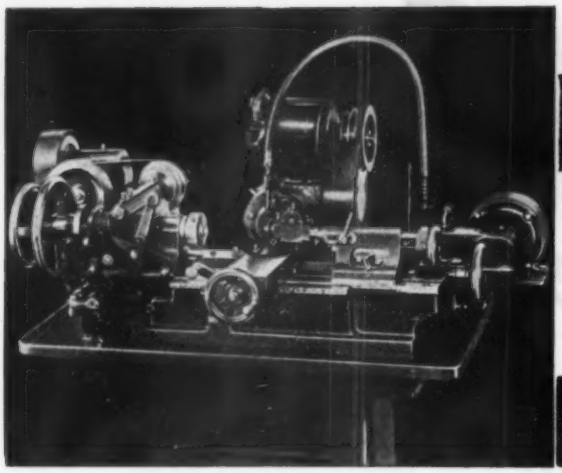
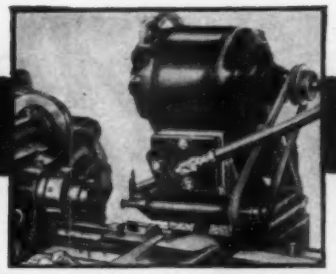
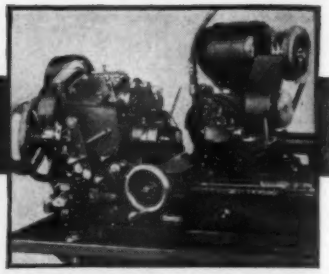




Machine equipped with Internal Threading Attachment having special motor driven cutter head.



Machine equipped with Relieving Attachment. Lead screw is replaced by a special work head.

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Produce standard and special thread forms with utmost precision and speed

These versatile machines will produce V, N, Whitworth, Buttress and other thread forms accurately and at a high rate of production. Regardless of the type of thread, convenience, speed and high precision are definitely assured.

The capacity of these machines is such that precision threads and small worms can be produced up to 2" in diameter. However, they will swing pieces as large as 3" diameter. They can be furnished for single or multiple cutter use.

An important feature is the use of three motors — for speed, feed and oil respectively — which permits individual speed change and reverse for both cutter and work and a constant speed for the pump. All motors are controlled from a single start and stop station.

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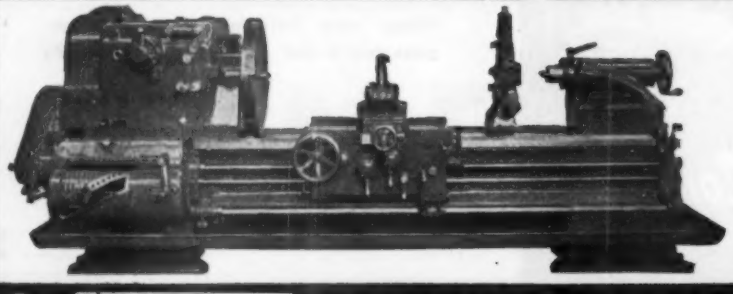

for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

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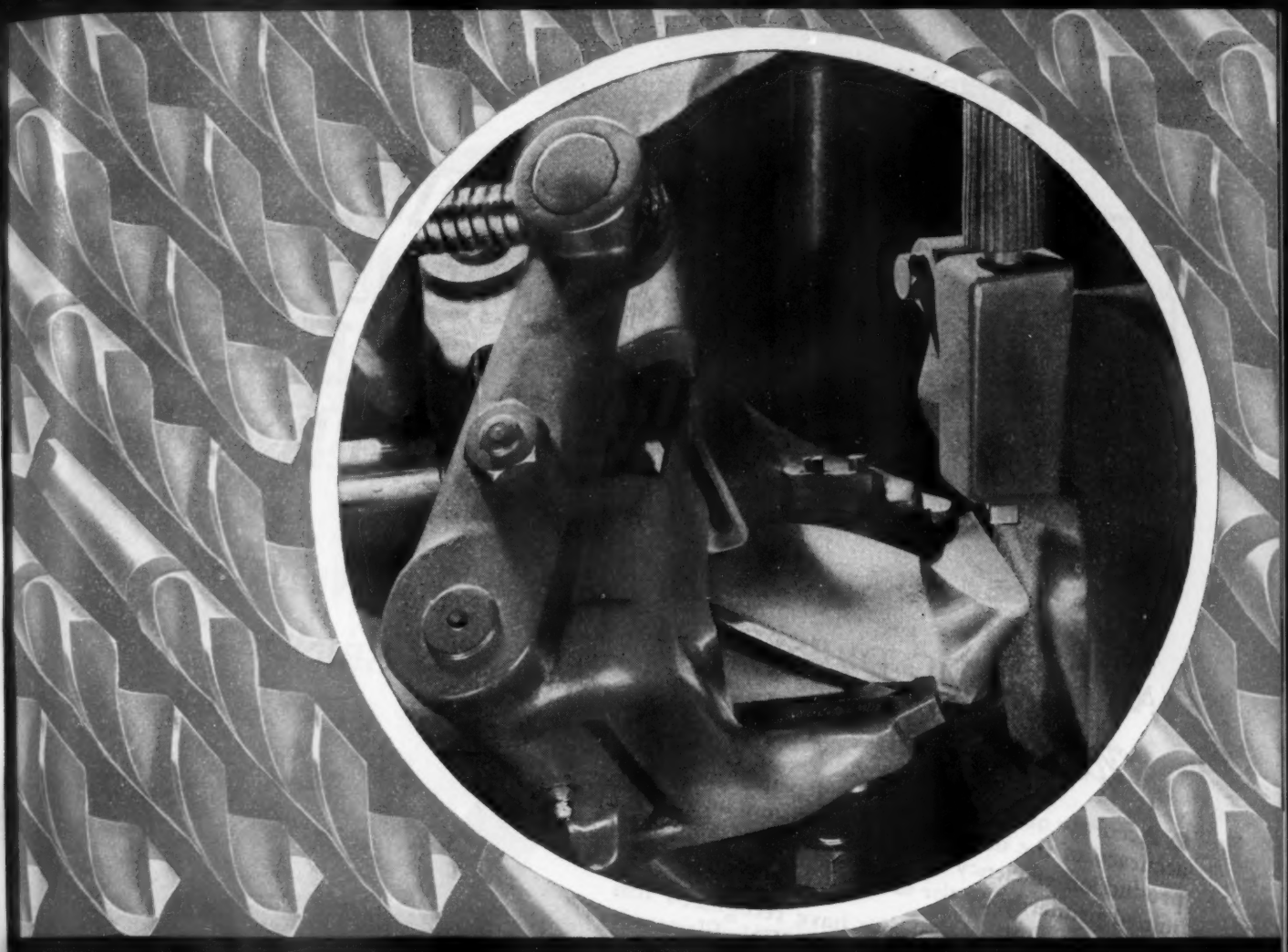
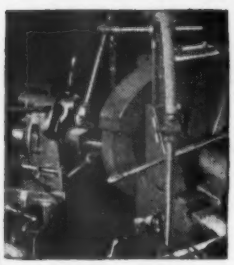


The First Point and the 10,000th will be SCIENTIFICALLY CORRECT!

SELLERS NO. 1-G DRILL GRINDER with cabinet. Grinds either straight or tapered shanks in sizes from .028" to ½" dia.



SELLERS NO. 4-T TOOL GRINDER. A fully universal grinder for single point tools of every shape—from ¼" sq. to 1½" x 2".

IF fast, accurate drilling is important to your production you will find the answer in a

SELLERS DRILL GRINDER

It's more than a machine. It's a *method* of grinding which automatically produces the scientifically correct drill point required for precision work. Angles of inclination are equal, contour of lips is identical, resulting in a point which drills true cylindrical holes faster and more holes per grind.

Inexperienced girls are quickly trained to turn out a continuous supply of perfect drill points—reducing both your drill inventory and drilling costs. Sellers Drill Grinders are made in 3 sizes to accommodate drills from .028" up to 3". Shipped complete, ready to plug in and go to work!

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For proof of why it will pay you to equip your tool room with this modern machine, send us three drills of any size up to 3 ins. and we will return them ground with the Sellers point. No charge, no obligation.

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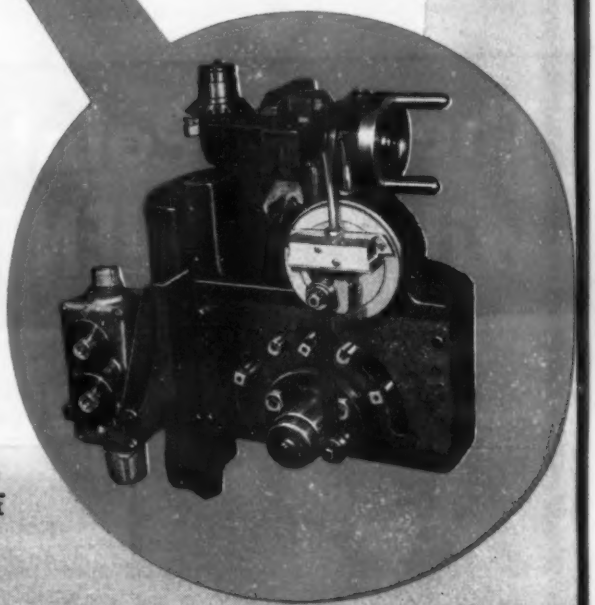
● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in *better* thread grinding, and a *low-cost* investment at that!

An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.



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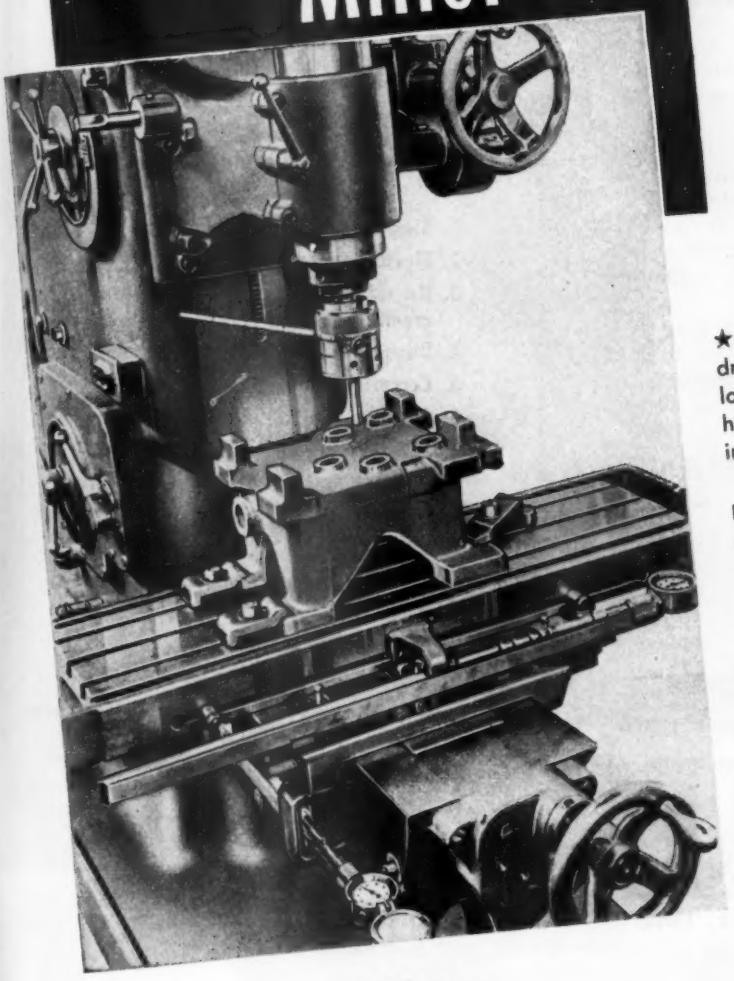

1. CAPACITY: Enables users to turn out highest quality work at greater speed whether for large work or small — milling or boring — roughing or accurate finishing cuts.

2. ACCESSIBILITY: This feature brings three benefits to your production — efficient operation — faster manipulation — quicker set-ups.

3. RIGIDITY: Here is an important aid to increasing production volume and insuring standards of workmanship.

4. VERSATILITY: This advantage greatly simplifies many setups, that would otherwise be difficult to obtain.

5. ACCURACY: Simplicity of operation and the arrangement of single set of controls insure this feature.

★ The picture shows holes being bored in a drill jig. A dial indicator is being used on longitudinal and cross movements to locate holes quickly and accurately without preliminary layout.

Dial indicators for quick and accurate locating, a large accurately fitted spindle to insure round and straight holes, and table slides that are square, make KNIGHT MILLERS exceptionally valuable in precision boring.

KNIGHT MILLERS' wide range of spindle speeds, solid table unit, and ease of handling provide efficient, fast production and accurate results on such light milling operations as profiling, milling, boring, slotting, and keyway cutting — all at one setting.

Power and rigidity permit heavy milling of large forgings to give you results that meet today's rigid inspection for finish and tolerances.

KNIGHT MILLERS are fast, compact, complete, and convenient to handle. Write for our catalog that gives complete descriptions.

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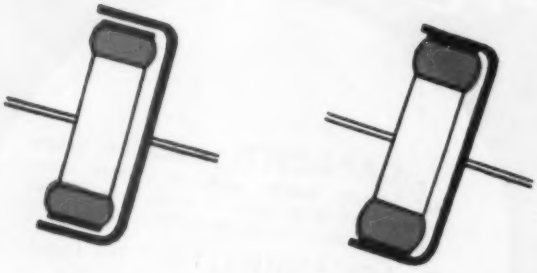
A Heavy Duty Clutch can be Simple– Positive– Trouble-free



See how it works

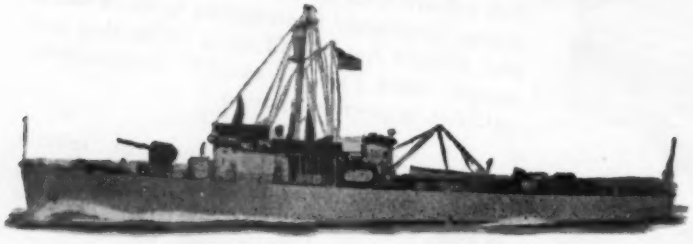
This is a new type of heavy duty clutch. It controls power by air pressure. It is a new—but thoroughly proved—way to transmit power from its source to the machine that does the work.

At the left you see a diagram showing the clutch disengaged. A rubber and fabric air gland, on the drive member, rolls free of the driven member.

At the right, you see the gland inflated. It expands against the driven member, to effect a clutch action that can be as light, or as firm, as you want it. Deflate the gland and the clutch is disengaged.

That's the principle of the Fawick Airflex Clutch—as simple as that! It requires no levers, arms, toggles or springs—no lubrication. No adjustment—low maintenance—long service.

Here is PROOF OF PERFORMANCE



Many hundreds of Vessels in the Navy and Merchant Marine are equipped with the Fawick Clutch.

For descriptive book write to

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio

In Canada, Renold-Coventry Ltd., 1006 Mountain St., Montreal, Canada

In Britain, Crofts Engineers, Ltd., Bradford, England

Here is the CLUTCH that brings you *these 12 Advantages*

1. Simple in design and operation
2. Flexible control by air
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4. Dampens vibration—absorbs shocks
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Especially suited for

Heavy Machinery Drives
Paper Mill Drives
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POWER CONTROLLED BY AIR

★ Standard sizes carried in stock for immediate delivery

HIGH SPEED STEEL

TOOL BITS

of Quality

★ Special sizes made to your order and specifications

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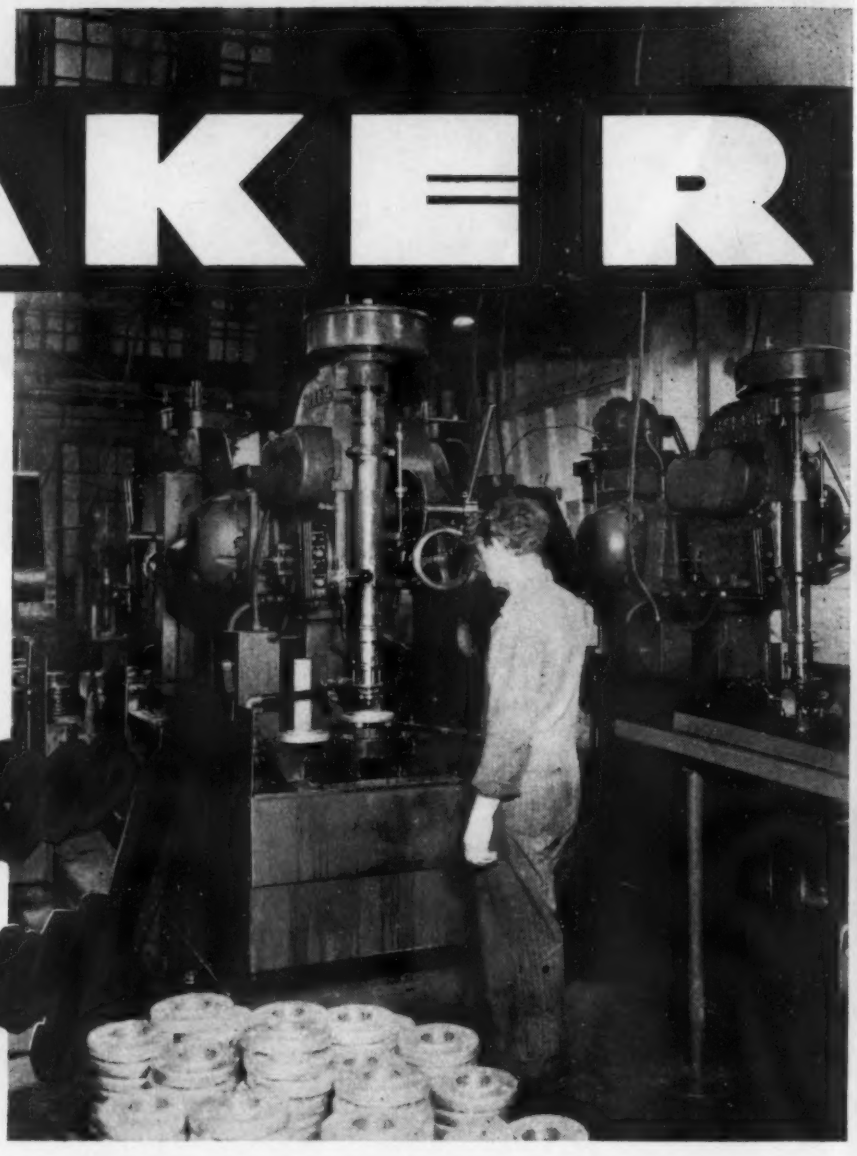


• Here BAKER Model 217's are "in the fight" . . . producing badly needed steel flanges for war-use. The machine illustrated uses receding type taps for tapping flanges, sizes 1½" to 4" taper pipe tap; thus clearly demonstrating the flexibility of BAKER heavy duty drills for tapping operations. Spindle is arranged with positive thread lead attachment to insure precision threading. Fixture design has been simplified so that flanges are located over previously drilled holes. A minimum of operating effort permits one man to operate two machines thus speeding production and reducing man-hours.

Whether your need is for special or standard drilling, boring or tapping machines BAKER has the facilities and experience to supply machines that will "do the job". Competent engineers are available to help you in solving special production problems.

ARMY E NAVY

Write for complete information.

BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

DRILLING • BORING • TAPPING

Our Motto Since 1867: "Machines Sturdy and Efficient, as Fine as Can Be Built..."

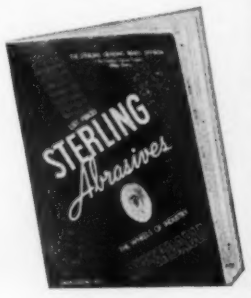
Sterling

Here We Trim Our Wheels (and the Japs) Down To Size!

There is a close connection between defeating our enemies and turning out Sterling Grinding Wheels in proper sizes, shapes, grains, bonds and structures. In all industry, grinding wheels are essential to victory production—they grind, polish, cut and finish to any desired degree.

Sterling workers are dedicated to the job of getting this war over as soon as possible. They know producing plenty of grinding wheels is one way to help. Our engineers, too, are assisting in trimming the Japs down to size by suggesting proper wheels to use in all types of plants. Sterling management, also, is contributing its share to victory by installing still another tunnel kiln, now in operation, to help turn out wheels faster.

What is your particular grinding problem? There is an answer to it in the excellent performance possible when Sterling's "Wheels of Industry" are used. Finding out the wheel you need for your job need not be guesswork . . we are ready to cooperate with you in turning out the products necessary to win the war—and the peace. Whether your problem is one of war production or post-war effort, we can help. Write us!



Our catalog is probably one of the most complete presentations of grinding information. It will be sent upon request.

• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

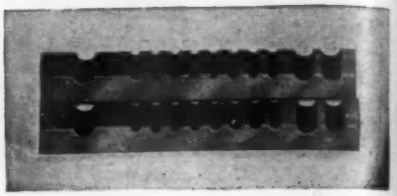
THE WHEELS OF INDUSTRY

DRESSING IS SIMPLIFIED . . . *by the New Time-Saving* C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS

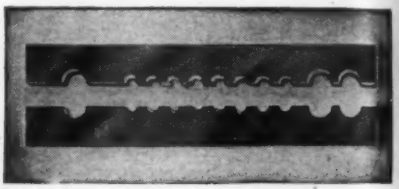
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

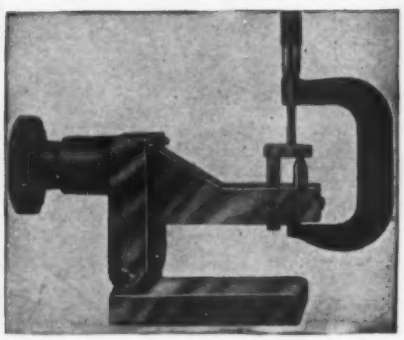
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



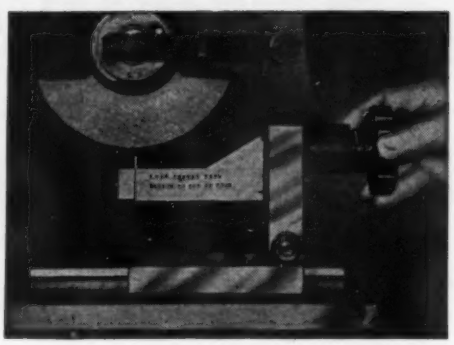
Two High Speed Tool Bits ground for drill jig.



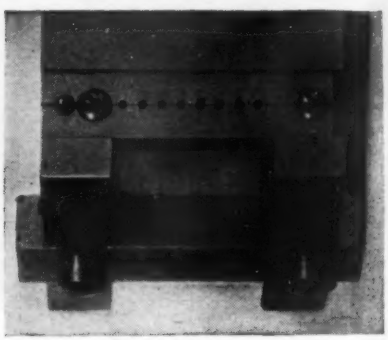
Drill jig completely assembled.



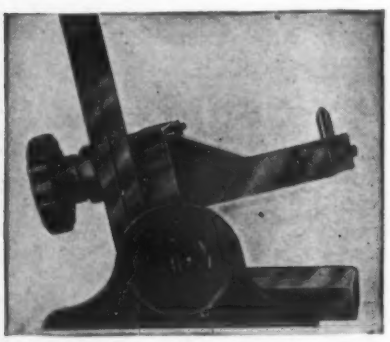
The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.



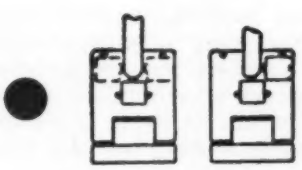
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to ⅜" can be held accurately in line with the vertical center line of spindle.

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing.

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, ¼ K diamond, $5.00.

SCHULTZ & ANDERSON CO.

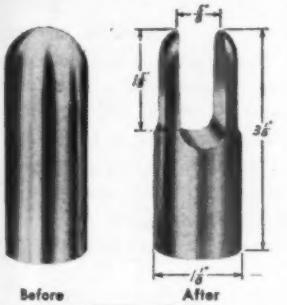
MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

355 Aluminum parts milled in 1 HOUR!

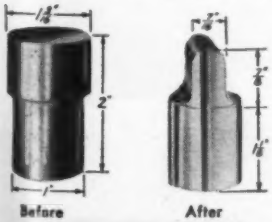
odel 10-E)
. Applied for

illing of 10 parts imultaneously increases roduction 100-500%



ALUMINUM PARTS

se aluminum parts were milled upon the rco Multi-Grip Chuck at the rate of 355 r hour (floor to floor) as compared with gle milling operations of only 71 per hour.



CHROME STEEL PARTS

se parts, high heat treated of Chrome-y, were produced at the rate of 62 per r (floor to floor) on the Aerco Multi-Grip ck. Individual milling time was 15 per r.

AERCO HYDRAULIC MULTI-GRIP CHUCK

check the operational features back of this record:

1. **A single loading for 10 parts:** new multi-grip chuck saves starting, stopping, cleaning fixture each time as with single-station units.
2. **No sacrifice of accuracy:** self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations.
3. **Pressure built quickly:** hydraulic hand pump lever builds pressure up to 2500 p.s.i. with a few strokes.
4. **Quick re-loading:** self-opening collets are quickly re-loaded; adjustable depth stop for each collet eliminates necessity for gauges.
5. **Safe operation:** work is held rigidly in collets and cannot turn or be pulled out during milling operation. Safety stop prevents damage to collets should all stations not be filled.
6. **No waste milling motion:** Parts are held to minimum center distance eliminating cutting air — plus advantage of two rows which again doubles increased production.
7. **Variety of collet capacity:** #10-B chuck has round collet capacity from ⅛" to ½" inclusive. #10-E chuck has round collet capacity from ½" to 1¼" inclusive. Square and hexagon collets available for both chucks.

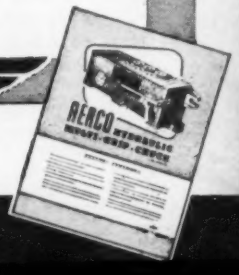
Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

AERCO CORP.

HOLLYDALE, CALIFORNIA

ARMY E NAVY



WRITE FOR NEW FOLDER

PLANATHREADING

2 THREADS MILLED AT COST OF ONE

A Real Saving

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THIS JOB IN 5 MINUTES

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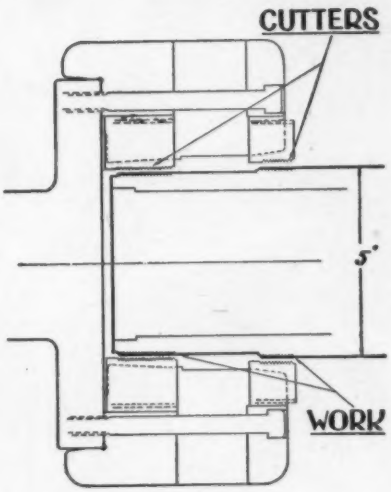
Perfect alignment and Location of Threads

LET US SOLVE YOUR THREADING OR MILLING PROBLEMS



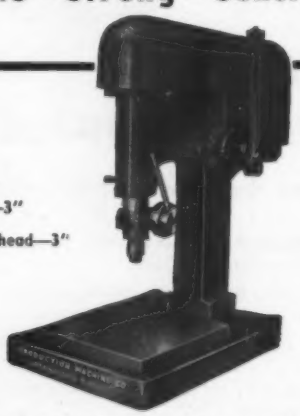
THE HALL PLANETARY CO.

Fox and Abbotsford Avenue

PHILADELPHIA, PA.

New TYPE 25 REED BENCH DRILL

Versatile - Strong - Sensitive - Simple



Capacity—¼"
Spindle travel—3"
Adjustment of head—3"

Table—11" x 11"
Spindle to column—7"
Motor—½ HP

A marvel of streamlined simplicity and efficiency, this new REED Bench Drill offers a fast, convenient means for handling all kinds of precision drilling within its capacity.

Drive is direct from motor to spindle; no moving parts, except drill chuck, are exposed; full ball bearing spindle; infinite spindle speeds, instantly available by hand wheel control, from 1500 to 10,000 R.P.M.

Made in from 1 to 4 spindle types, each spindle having its own individual motor drive.

Write for illustrated literature.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

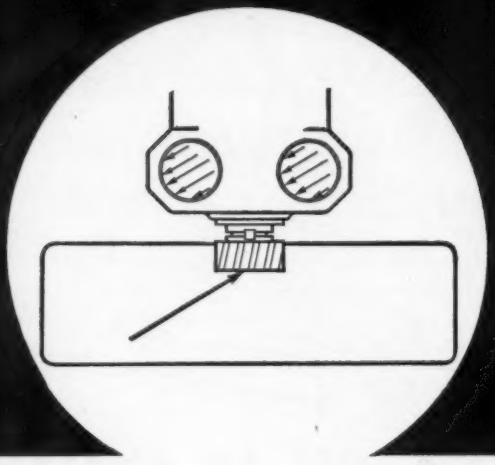
• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.

AKRON 11, OHIO

Balanced load

BETWEEN TWO POSTS...



Kent-Owens No. 1-14 Milling Machine with improved Hydraulic Control. Table 32"x9"; table travel 14".

Twin post mounting—*exclusive* on Kent-Owens Milling Machines—assures balanced load in either direction. This means no overhang and no cocking action. The head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. The result is an unusually rigid and accurate machine which is practically chatter-proof for either direction of table travel. Send for latest bulletin. Kent-Owens Machine Co., Toledo, Ohio.

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General Machinery Corp.

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SYRACUSE
J. F. Owens Machinery Co.

TORONTO
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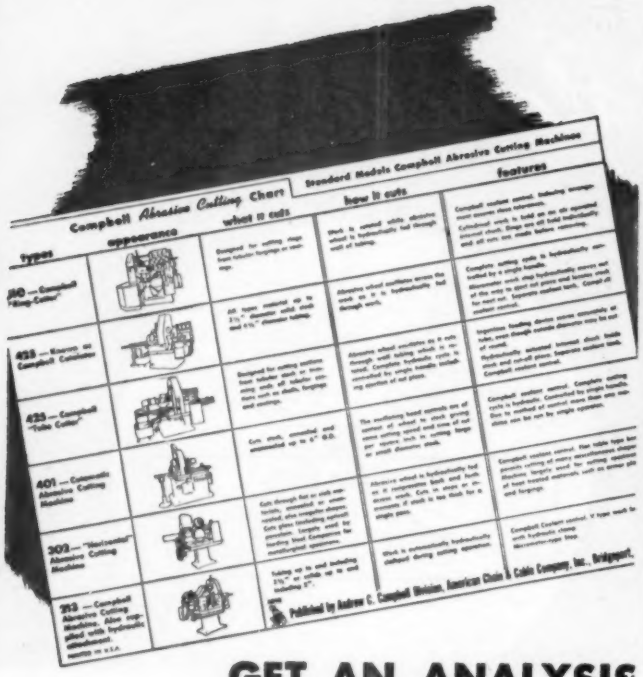
WALKERVILLE
F. F. Barber Machinery Co.

Call on KENT-OWENS for Milling Machines


Campbell Abrasive Cutting Chart
Standard Models Campbell Abrasive Cutting Machines
Types
appearance
what it cuts
how it cuts
features
Published by Andrew C. Campbell Division, American Chain & Cable Company, Inc., Bridgeport, Conn.

GET AN ANALYSIS OF YOUR CUTTING JOBS

—without obligation

Based on the actual production records of the CAMPBELL complete range—the only complete range—of Abrasive Cutting Machines, Campbell engineers will gladly work up cost sheets and production procedures for your cutting. • All you need do is state the materials, shapes and sizes you are cutting, lengths before cutting, lengths of cut-off pieces and production required per hour. • The schedules given you will be practical and attainable. They will be based on the performance of some one of the 8 types and 19 models of CAMPBELL Abrasive Cutting Machines that are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics—solid bars, tubular and flat stock. • Ask for a copy of the chart shown above, too. It will give you fundamental information on the possibilities of abrasive cutting.

Campbell Cutamatic No. 401
Oscillating and Rotating Wheel. Cuts steel up to 6".

Campbell No. 302
Odd shapes, Flat Stock, Slotting Flat Stock, etc.

Campbell No. 213
Cuts Tubing up to and including 3½". Solids to 2".

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Cuts Tubing up to and including 4½". Solid Bar to 3½".

Campbell

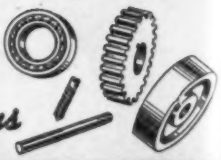
ABRASIVE CUTTING MACHINES

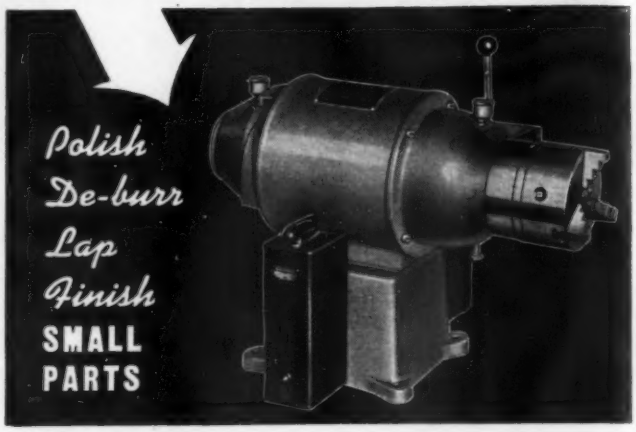
ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

SPEED LATHES

for Secondary Operations





Schauer Ideal Speed Lathes insure finer quality, greater accuracy and uniformity, coupled with increased output and lower cost. A size and type for every finishing purpose. State YOUR finishing problem. Write for Catalog 440.

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
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WITH REPLACEABLE POINT

ACCURACY • HIGH SPEED • HEAVY DUTY

A. Very large, for pipe or tubing work
B. Extra long point used in facing operation
C. Extra wide point for large diameter work
D. Standard point
E. Blank made of soft tool steel for nests
F. Female for work not having centers

KING PRODUCTS
67 SPRING STREET • NEW YORK 12, N.Y.

Rubber has revolutionized

DE-BURRING
FINISHING • POLISHING

Made in 3 textures for a wide variety of applications, BRIGHTBOY represents a *combination* of abrasive and resilient rubber. The rubber in Brightboy cleans and polishes, while the abrasive de-burrs and finishes.

The resiliency of the rubber and its relative softness—unlike harder abrasive forms—*cushion* the abrasive action. Combined with the abrasive, the rubber does an all-in-one job that eliminates the step-by-step operations between a grind and a buff, and frequently serves as the final polish.

BRIGHTBOY requires no special preparation before use. It is made in wheels and rods for use on grinders, lathes, drill presses and polishing machines, and in blocks with flat or curved surfaces for use on parts worked by hand. Methods and Applications are explained in an attractive booklet obtainable together with catalog and prices from your dealer or from us. Brightboy field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO. NEWARK, N. J.

As rubber product specialists for decades we have long appreciated and applied the advantages of rubber resiliency to various industrial and commercial items. Brightboy, a tested and proved synthetic rubber product, will continue to be available because of special purpose synthetic allotment by the War Production Board.

WELDON ROBERTS

Brightboy

REG. U.S. PAT. OFF.

Now... SHE feeds a hungry *machine*

Sure... she could tote a tray with the best of them . . . and flash a smile and a quip that kept them coming. But punch the cash register? Never! What did *she* know about machinery?

Well . . . look at her now . . . helping to win a war.

Easily operated, automatic, high speed machines, like the Bodine, enable thousands like her to handle ordnance parts at high production schedules. The Bodine basic principle of design combines an automatic indexing dial with multiple spindles which operate on work placed in position on the dial. Spindles may be located at variable work stations to perform drilling, milling, tapping and screw inserting from *above, below* or from *any angle.*

The operator merely feeds and ejects the work—although under many conditions even the ejection is automatic. Moreover, several operations may be performed on each part as it progresses from station to station during one cycle of the dial.

Yes, women may be quickly trained to become efficient operators...and they like the low fatigue factor of running a Bodine.

DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

BODINE does this:

1. Builds 6 sizes of automatic dial type machines and develops correct tooling set-ups to perform the operations you require.
2. Provides extreme flexibility in the basic design to permit tooling for an exceptionally wide range of parts.
3. Provides up to 8 spindles with capacities ranging from ¼" to ½" dia. with vertical stroke from 13/16" to 3½" in depth.
4. Permits high speeds with extreme accuracy . . . minimizes down-time by means of automatic electrical devices which protect machines, tools and operator.

Ask Bodine engineers to make recommendations from your blue prints or sample parts to solve tough production problems. Interesting and instructive bulletin on request.

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

For Fast Accurate Threading

and for Quicker Production on Threaded Parts

There's Nothing Like

MURCHEY

Threading Tools

4 WEEKS DELIVERY

● This Type "G" (non-rotating) Self-Opening Die Head has established an enviable record. It is regarded with highest respect and admiration wherever threaded parts are needed to help win America's production battle. Type "G" is designed and engineered for use on any machine where die heads do not rotate. Made in sizes from 7/16" up to and including 6".

Write for literature on Type "G"—also on a companion product, Type "C-O" (rotating); on Collapsible Machine Tap Type "B-M" and on Murchey Thread Milling Machines, Shell Tapping Machines and Roller Pipe Cutting-off Machines.

MURCHEY MACHINE & TOOL CO., Dept. A—DETROIT 26, MICH.

MURCHEY

HOW TO GIVE A BOMBER'S ENGINES THE SPARK OF LIFE

"Start Number One!" . . . and an unfailing electric whip lashes thousands of sleeping horses to a thundering roar of readiness. Then three more flicks of the lash, and the bomber sprints down the runway to leap into the air . . . target-bound.

That purple ignition spark is the *spark of life* for warplane crews . . . lifting them, keeping them aloft, bringing them back to base. And a sense of this mortal obligation is carried deep in the minds of all at Veeder-Root who produce the magnetos that supply this spark . . . and of those who patiently test them far beyond the ultimate demands that will be imposed.

And why is part of the nation's vital magneto production given to men and women who have previously made counting and computing devices? Because *this responsibility must be in good hands, beyond the shadow of a doubt.* Pilots, crew members, and their families *can count on these hands* to keep a plane's spark of life ready, strong, and steady . . . just the way they have been doing, all along. And there are no more capable and conscientious hands than those long-trained in mathematically honest mechanics — which are the basis of counter-manufacture.

The Counting House of Industry

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INCORPORATED
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WHEN THE ALL CLEAR SOUNDS YOU'LL Save Months IN RECONVERSION WITH Walker-Turner MACHINE TOOLS

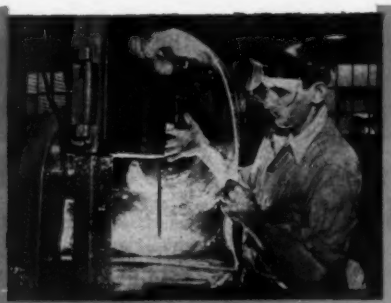
(Radial Drill)
Typical example of Walker-Turner versatility is this Radial Drill. Drills to the center of a 62" circle. Spindle speed range, 160 to 8200 R.P.M. Head tilts 45° in either direction.

These streamlined units deserve a place in your reconversion — because they're flexible, rugged, simple, safe, easy to operate, and offer a wide range of speeds for cutting practically any material. On the "costs" side, Walker-Turner Machine Tools show marked savings in power consumption, capital investment and operating expenditures. And fast delivery . . . to help you avoid reconversion delays . . . will be another Walker-Turner feature.

WALKER-TURNER COMPANY, Inc., Plainfield, N. J.

(20" Drill Press)
Automatic power feed is a feature of the newest Walker-Turner 20" Drill Press.

(Metal Cut-off Machine)
"Kick" cutting with a Walker-Turner Radial Cut-off machine.



(Band Saw)
Cutting a special profile in plastics with a Walker-Turner Band Saw.

101

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

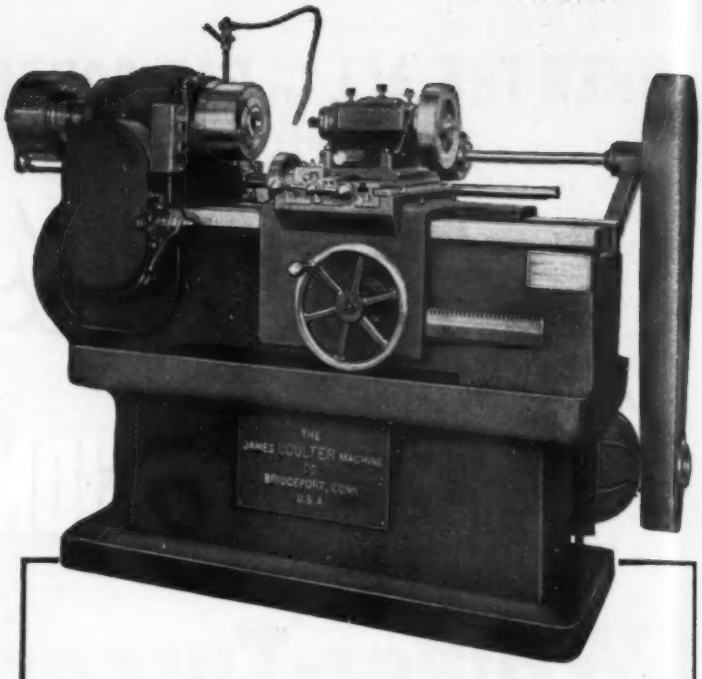
DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

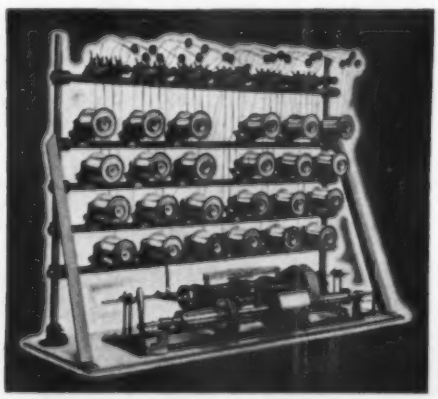
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.



FIDELITY
Double-End Screw Traverse Spooling Machine . . .

For multiple-end winding of fine wires—sizes .008 to .030 up to twelve ends on each spool.

Delivers a smooth, uniform lay at speeds from 40 to 800 feet per minute—depending on size and kind of wire.

Tension and brake control prevent overrunning; slow acceleration avoids wire breakage, and adjustments provide for various wire sizes and types.

New catalog of FIDELITY Wire Spoolers describes other units. Write for it.

Buy Bonds to bring the boys down the Home Stretch

33 YEARS' EXPERIENCE

Intricate, Automatic Precision Machines

FIDELITY MACHINE COMPANY
3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT • • • OHIO

with

Wickman

SWISS TYPE AUTOMATICS

and their various attachments

In addition to normal turning and forming operations

The No. 2 Wickman machine illustrated is equipped with both three-spindle and slotting attachments. Three other attachments for drilling, threading and taper turning are also supplied for this machine. All Wickman attachments are easily interchangeable.

Do you manufacture parts which are in any way similar to those illustrated above—which require any of the operations listed? Are you interested in holding production runs of those parts to tolerances of ± .0005" or closer and securing finishes as fine as 25 micro-inches? If your answers to these two questions are in the affirmative, Wickman Swiss Type Automatics have a place in your production.

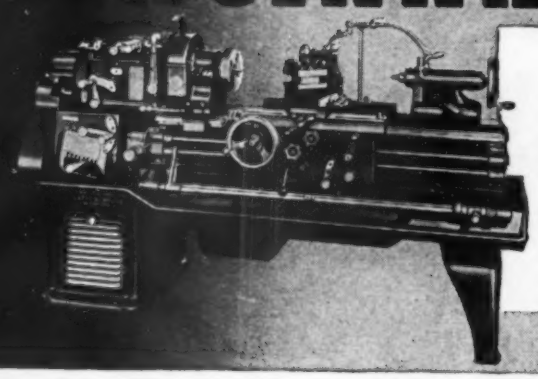
Two Swiss Type Automatics are produced by Wickman. The No. 2 machine shown above has a ½" bar capacity and will handle pieces up to 4" long. The No. 1 machine has 5/32" bar capacity, maximum length capacity of 1 9/16".

LET US SEND YOU FULL INFORMATION

THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT 6, MICHIGAN

CINNATI LA



Assure High Production to Exacting Standards

Ruggedness, accuracy, versatility and speed are combined in Cincinnati Lathes in exactly the right proportion to meet the rigid demands of war production. If you will outline the aircraft, munitions or other similar jobs which require improvement in handling, our engineers will gladly offer suggestions for tooling which will assure the utmost in accuracy and output. Send for catalog giving details of Cincinnati Lathes—in sizes from 14" to 30".

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.

WORCESTER, MASS.

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
918 Tilden St.
Saginaw, Michigan

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

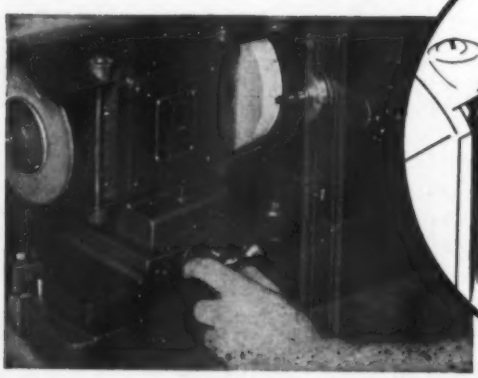
Die-Making Machines

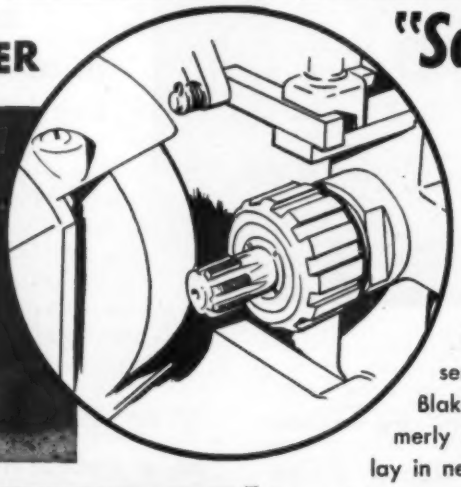
They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

BLAKE TAP GRINDER





"Salvaged $30,000 worth of taps"

IN ONE YEAR — ON ONE MACHINE

This is a comment of a Blake Tap Grinder user — a comment which deserves your consideration. Not only do Blake Grinders salvage taps that were formerly discarded, but they help avoid the delay in new tap delivery. Dull taps are expensive taps — prevent trouble before it starts by keeping all your taps sharp at all times! This can be done easily, quickly and cheaply on the Blake (even with green help).

Blake Grinders are available in two models — the No. 1 for taps up to 6 inches long — the No. 2 for taps up to 14 inches long. Both models will sharpen taps with 2, 3, 4, 5, 6, 8 and 10 flutes, either right- or left-hand. *Send the coupon for complete details.*

EDWARD BLAKE CO.

634 COMMONWEALTH AVENUE
NEWTON CENTRE 59, MASS.

Please send me your illustrated catalog which gives complete details on the Blake Tap Grinders.

Name..... Title.....

Company .....

Street .....

City..... State.....

A.M.

BLAKE TAP GRINDERS—L & D HIGH SPEED DRILL PRESSES—WALTHAM CUTTER SHARPENERS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS

THESE MEN "TAILOR" TAPS

BEHIND the scenes ..... "Greenfield" screw thread engineers look over each order for "Greenfield" Taps.

They are "tap tailors" extraordinary!

If you merely want a "ready-made" tap of a certain size — you will automatically get the benefit of refinements in design worked out by these "Greenfield" engineers.

But if you give them more information — as to the "fit" desired, as to the material to be tapped, as to operating speeds, etc., then these men can be of extra service in tailoring a tap to fit your needs.

"Greenfield's" engineering staff is large and highly trained. They are continually enlarging the frontiers of screw thread knowledge as a result of more than 70 years of research in Greenfield.

GTD GREENFIELD

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*Have you copies of our new booklet "Selecting the Right Tap For the Job" which summarizes the data needed in ordering taps?

GREENFIELD TAP AND DIE CORPORATION • GREENFIELD, MASS., U.S.A.

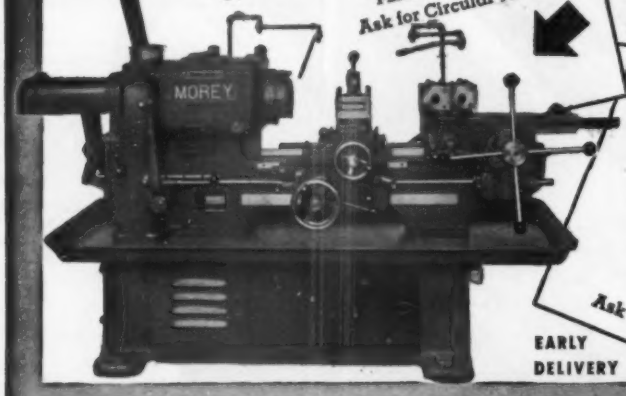
MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



INFINITE SPINDLE SPEEDS —Electronically Selected—

DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. IG INTERNAL GRINDER
No. 34 VERTICAL SPINDLE SURFACE GRINDER
No. 1½ HAND FEED SURFACE GRINDER
No. 3B AUTOMATIC FEED SURFACE GRINDER
No. B-11 PLAIN MILLING MACHINE

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

ROCKFORD MACHINE TOOL CO.
Hy-Draulic
Shapers . . Planers . . Slotters . . Shaper-Planers
— ROCKFORD, ILLINOIS, U. S. A. —

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

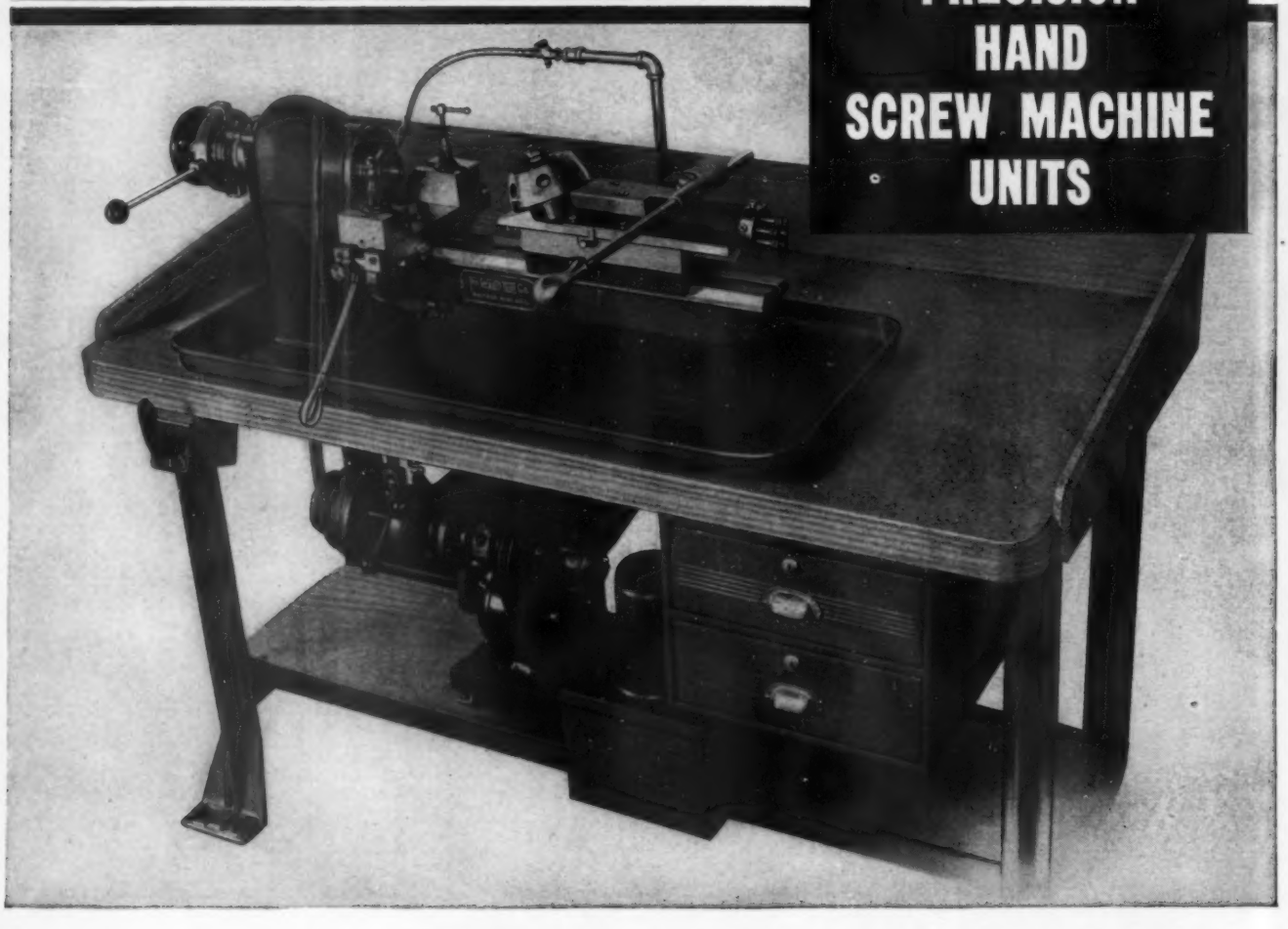
ARMY E NAVY

Compact in design—sturdily constructed—foolproof in operation—this powerful DeWalt will *speed up* your cut-off operations not only in today's emergency but long after the war is over. Write for descriptive literature.

DE WALT
PRODUCTS CORPORATION
LANCASTER, PA.

You Can Get The Work Out With These Versatile, Wade Standard

PRECISION HAND SCREW MACHINE UNITS



Wade

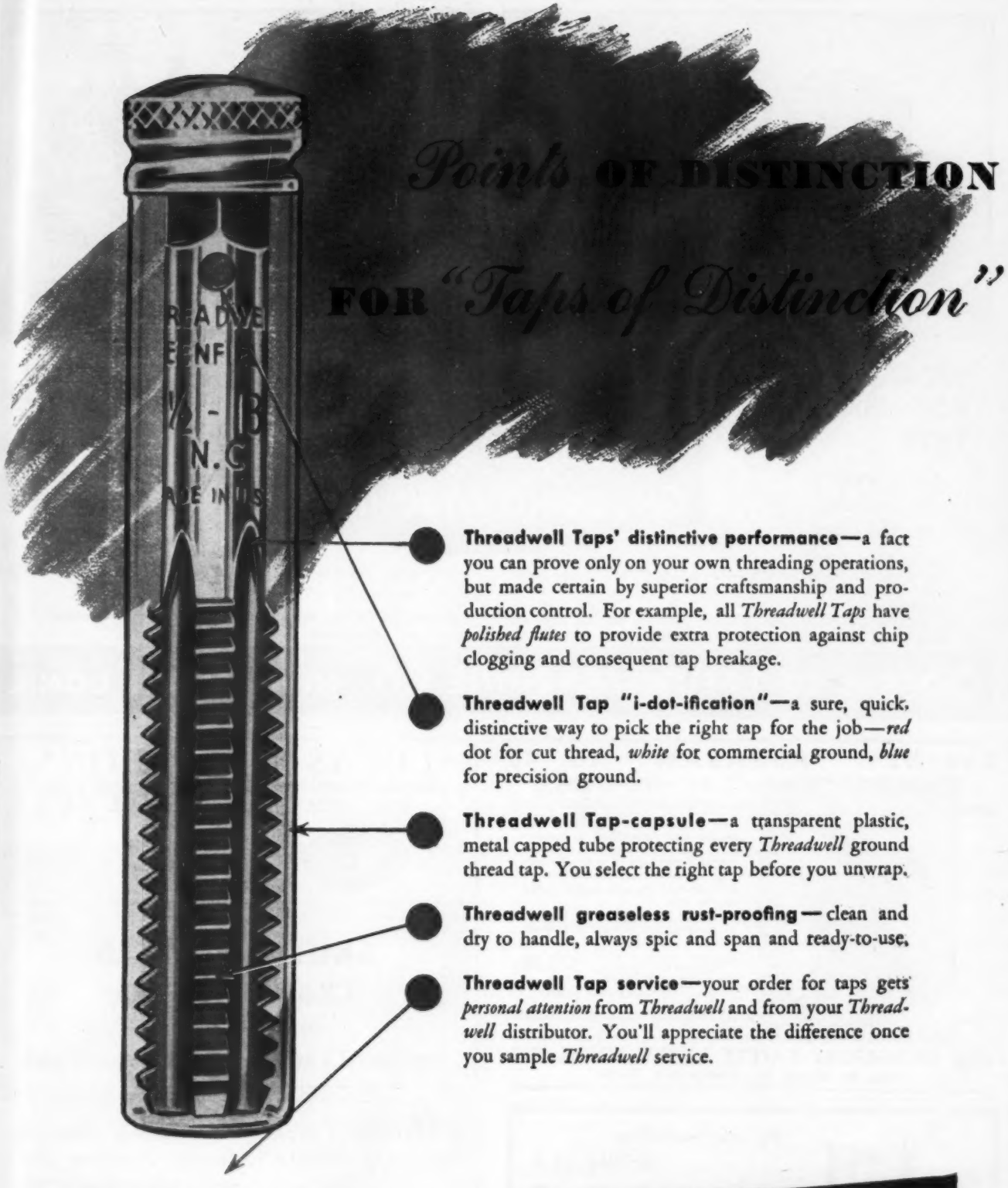
Bench Lathes and Profilers For Precision, Versatility And Stamina

Wade Standard Precision Hand Screw Machine Units get the work out . . . they're built for precision production operations. • Headstock has double row roller bearing. • Lever Closer runs on ball bearing; operates positively to open or close collet with instant movement. • Double Cross Slide movement 2¾"; provided with adjustable stops. • Automatic Turret Attachment; Tilted self-clamping 6-station head; takes ¾" shank tools; Adjustable stops index automatically. • Turret working travel 3¼"; indexing travel 1"; total 4¼". • Unit has 32" bed. • Collet cap: Model #5, ¾"; #7, 1". • Weight, net: #5, 172 lbs., #7, 184 lbs., with laminated maple top steel bench, approx. 660 lbs.

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS



Points OF DISTINCTION FOR *"Taps of Distinction"*

Threadwell Taps' distinctive performance—a fact you can prove only on your own threading operations, but made certain by superior craftsmanship and production control. For example, all *Threadwell Taps* have *polished flutes* to provide extra protection against chip clogging and consequent tap breakage.

Threadwell Tap "i-dot-ification"—a sure, quick, distinctive way to pick the right tap for the job—*red* dot for cut thread, *white* for commercial ground, *blue* for precision ground.

Threadwell Tap-capsule—a transparent plastic, metal capped tube protecting every *Threadwell* ground thread tap. You select the right tap before you unwrap.

Threadwell greaseless rust-proofing—clean and dry to handle, always spic and span and ready-to-use.

Threadwell Tap service—your order for taps gets *personal attention* from *Threadwell* and from your *Threadwell* distributor. You'll appreciate the difference once you sample *Threadwell* service.

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and
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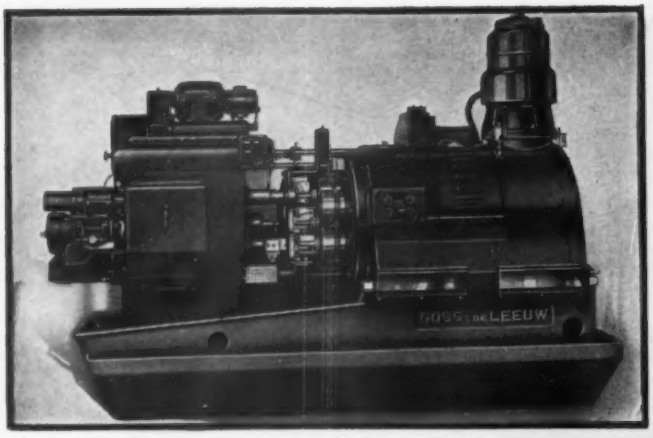
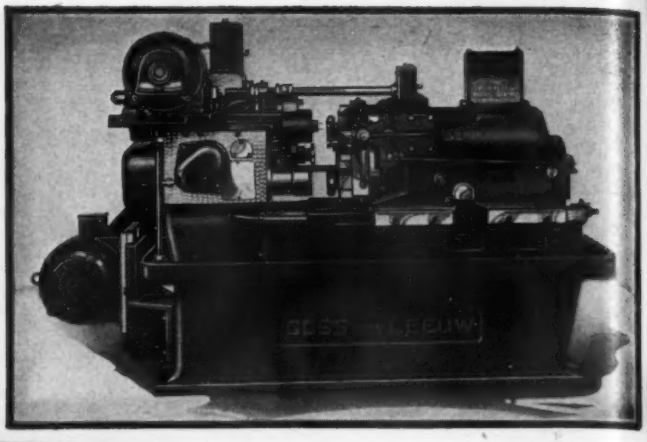
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

The NEW "ABRASAW" No. 47

CUT-OFF MACHINE

This pedestal type machine — improved and streamlined in appearance and construction — provides machine and base in a single casting. Large coolant tank is now in base of machine with coolant pump at the rear.

Vises can be furnished for straight or combination straight and angle cuts.

Capacity: Solids up to 1"; tubing and light sections up to 2".
Floor Space: 28" x 50".

Send for complete details.

THE BRIDGEPORT SAFETY EMERY WHEEL CO.
1286 W. Broad St., Bridgeport, Conn.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

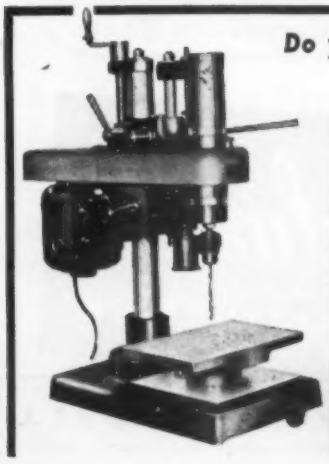
NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

SMITH & MILLS
CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio



Do your sensitive drilling on a

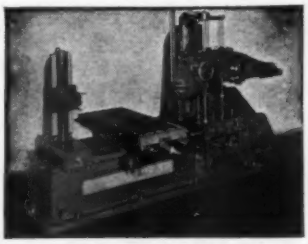
MAXI-JR-E

● Here is a high production unit for small holes from .004" to .250" diameter. Sturdy — smooth — fast —it is a self contained unit with 8 inch vertical adjustment on column. Drilling unit overhang from center of chuck to column 5". Vertical capacity 10". Available in spindle speeds from 750 to 12,000 r.p.m. Write for bulletin.

The Hamilton Tool Co.
HAMILTON OHIO

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

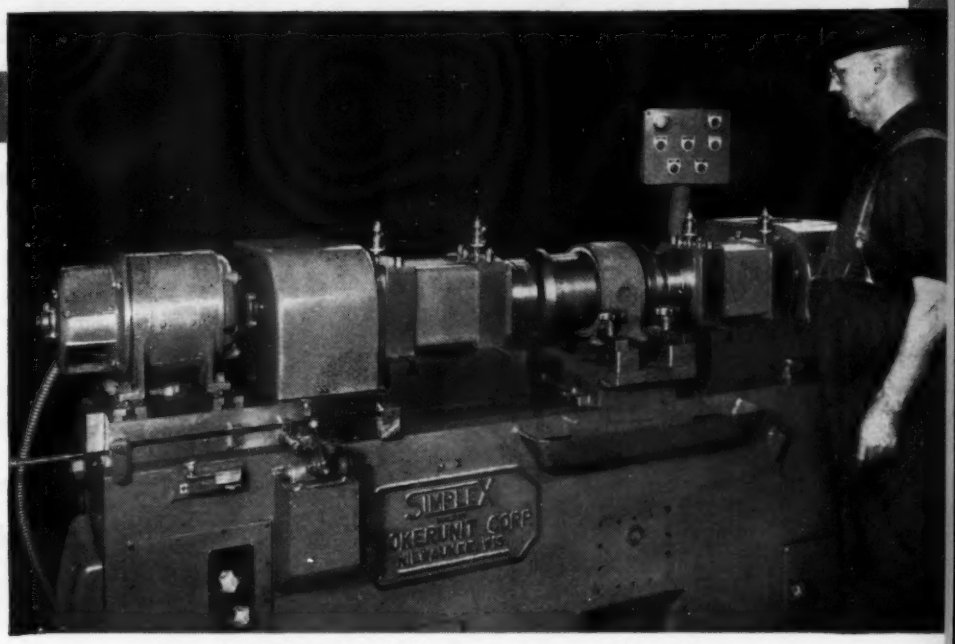


Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

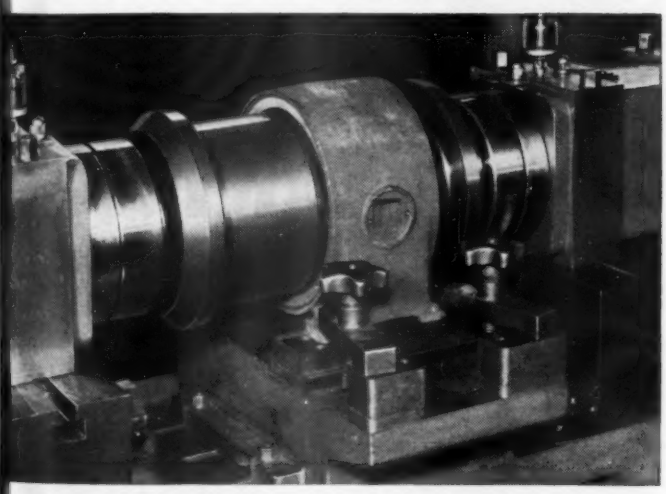
accuracy speed and finish } Combined by a STOKERUNIT SIMPLEX Precision BORING MACHINE

The finished motor stator yoke as it came from the Simplex Precision Boring Machine



Conveniently located push-button controls govern the entire machining cycle of this Simplex 2-U Two-Way Precision Boring Machine

Precision Boring and Facing on Motor Stator Yoke Completed In One Operation With 2-U Two-Way Model



Fixture is built with interchangeable locators for various sizes

Boring, facing and counterboring operations on this motor stator yoke were combined by the manufacturer into one operation with a Stokerunit Simplex 2-U Two-Way Precision Boring Machine.

Four tungsten carbide cutting tools, three on the long end, one on the short end, operate simultaneously to complete the three required boring operations at different diameters and depths in a minimum of boring time. Ease and speed in set-up of the part also brought savings in floor-to-floor operations.

In addition to savings in time, the manufacturer obtained high finish and close tolerances on all required bores. All diameters were held well within tolerances of +.002" and −.000". This model is capable of maintaining accuracy to .0002" with excellent finish and is also used for the boring of both larger and smaller stator yokes. Only minor adjustment of the machine and a change in the size of cutting tools used are necessary to adapt the Simplex 2-U Two-Way Model for use in the precision boring of these parts.

Write Today for these two Simplex Booklets which contain complete data and specifications on the entire line of Stokerunit Simplex Precision Boring Machines. For specific recommendations send blueprints of parts together with your production requirements. You are under no obligation.

Stokerunit Solves Your Boring Problems

Twenty-five versatile models of Stokerunit Simplex Precision Boring Machines are available, covering almost the entire range of precision boring applications. They are furnished with either hydraulic or mechanical feeds, with single or multiple spindles and are adaptable to either short-run or production work. Simplex precision boring machines enable you to obtain accuracy and finish in boring, even with inexperienced operators.

STOKERUNIT CORPORATION

SIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINE

4524 WEST MITCHELL STREET · MILWAUKEE 14, WISCONSIN

Bridgeport

TURRET MILLING MACHINE
. . . the all-purpose machine with unparalleled range of utility

This machine will mill, drill, bore and shape at all conceivable angles. All angular settings in one plane are achieved by merely turning hand wheel controlling keyed overarm. It has always been furnished with the well known Bridgeport High Speed Milling Attachment which provides for drilling and boring at all angles without changing work setup.

Column, knee and table are of rugged construction. Wide ways and taper gib assure accurate, vibration-free operation. Entire machine is anti-friction bearing mounted.

NOW EQUIPPED WITH NEW SHAPING ATTACHMENT

This new attachment on back end of overarm is of sturdy construction and can be set at all angles. It provides for shaping such work as large and small dies and molds as well as for intricate production jobs involving slotting operations.

The "Bridgeport" Shaping Attachment is now available to every owner of Bridgeport Turret Milling Machines. Shaping and Milling Attachments can be mounted on all types of milling machines. They are in extensive use on special production equipment.

CONDENSED SPECIFICATIONS

Longitudinal Feed—20"
Cross Feed—9"
Vertical Feed of Knee—16"
Table—9" x 32"
Spindle Speeds—(Milling Unit) 175, 425, 700, 1050, 2100, 4250

WRITE FOR ILLUSTRATED BULLETINS GIVING FULL DETAILS

THE BRIDGEPORT MACHINES, INC.
Bridgeport, Conn.

GRAND RAPIDS

No. 15 Motor Driven Surface Grinder
HAND FEED

•

FOR SMALL DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

CATALOG ON REQUEST

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S. W.
GRAND RAPIDS MICHIGAN

Quickly Pays Its Way

IN BUSY TOOL ROOMS

Here's a little machine that will pay big dividends from its first job and thru a long life of busy performance. It will pay you to install a

LINLEY

HIGH SPEED VERTICAL MILLING and JIG BORING MACHINE to take the

many small but important jobs that should not be scheduled for costly machines of higher capacities.

The Linley has 8 speeds, from 275 to 4250 r.p.m. . . . direct micrometer measuring device which prevents pencil figuring errors . . . counterbalanced quill to eliminate backlash and compact, rugged design to insure rigidity and precision performance.

For dies, jigs, milling, drilling, patterns, models, reaming and jig boring at low cost you can't beat the Linley.

Send for illustrated Bulletin

LINLEY BROTHERS COMPANY
664 State St. Extension
BRIDGEPORT 1. CONN.

Protect Dead Centers with DIXON'S

LATHE CENTER GRAPHITE LUBRICANT

AND SPEED THE JOB

Read what experienced machine shops write:

"Eliminates burning entirely"

•

"Am enabled to use centers indefinitely"

•

"Can increase speeds without undue heating"

DIXON'S Lathe Center Graphite Lubricant is made especially to lubricate dead centers of lathes. It provides effective protection against overheating, softening and scoring. Increases production by permitting heavier cuts and higher speeds. Promotes accuracy by permitting tighter set-up.

Use it also for steady rests, jack screws and other applications where a lubricant of extreme film strength is required.

IN HANDY TUBES
Easy to Apply

1, 4 and 8-oz. at your regular supplier or write for printed RLC69.

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.

I would like to try Dixon's Lathe Center Graphite Lubricant. My supply houses are:

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NAME _____

ADDRESS _____ 69.

5421

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON famous FIRSTS 1ST

The important developments that WELDON has pioneered for improved efficiency and greater economy in the use of cutting tools represent a distinct contribution to the industry. It is with justifiable pride, therefore, that the following Weldon "firsts" are listed:

FIRST

WELDON DOUBLE-END END MILLS—WELDON was first to introduce the Double-End End Mill. Having one shank for two cutting ends the initial cost for this tool is considerably less than that of two single-end end mills of equal size.

FIRST

WELDON COMBINATION STRAIGHT SHANK WITH FAST SPIRAL—Another important "first" for WELDON was the combination "fast spiral" straight shank end mill—one of the most widely copied tools in the industry.

FIRST

WELDON HOLLOW GROUND TEETH AND DOUBLE BACK OFF—To take full advantage of the increased spiral angle, WELDON was first to develop the hollow ground tooth and double back off. Result—a longer-lived, non-clogging end mill.

FIRST

WELDON "CUPPED END" END MILL—WELDON pioneered and patented the "cupped end" end mill which insures greater strength of the end teeth and prevents chips from clogging the teeth on the ends.

FIRST

WELDON QUICK CHANGE ADAPTERS AND HOLDERS—To speed production, WELDON developed the Quick Change adapters and holders—the first of its type in the industry. Permits quick change from one size holder to another without loosening the spindle draw bar. Accommodates shank diameters of 7 sizes.

FIRST

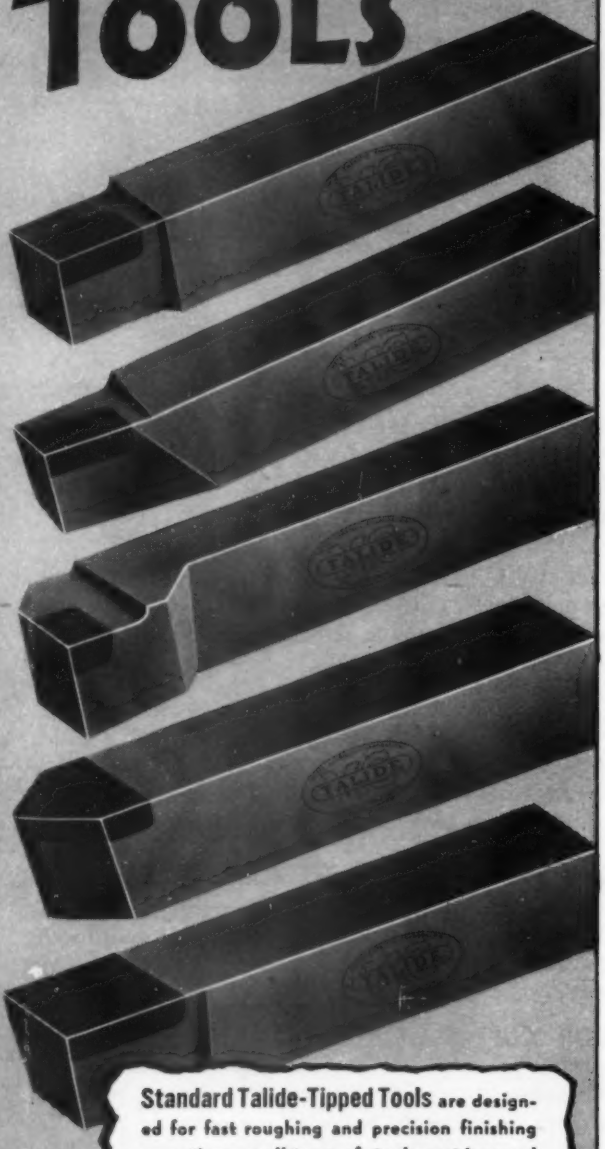
WELDON END MILL SHARPENING FIXTURE—This Weldon "first" provides a simple and effective method of reconditioning end mills of all types from 1/16" to 2" inclusive, without use of centers or lead cams.

We can make immediate shipment of most sizes of WELDON End Mills . . . Write for Stock List

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

TALIDE-TIPPED TOOLS



Standard Talide-Tipped Tools are designed for fast roughing and precision finishing operations on all types of steels, cast iron and non-ferrous metals. Available in both Tungsten Carbide and Tungsten-Titanium Carbide compositions, Talide Tools give longer run, higher speed performances on all kinds of machining operations including turning, boring and facing. Send for catalog No. 43-T.

TIPPED WITH TALIDE TUNGSTEN CARBIDE

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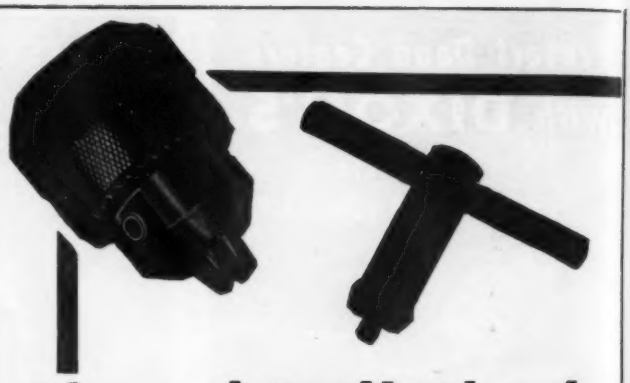
TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS



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THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

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The Original Manufacturers of Drill Chucks

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These new improved type testers available from stock.

Made Only By

WILSON
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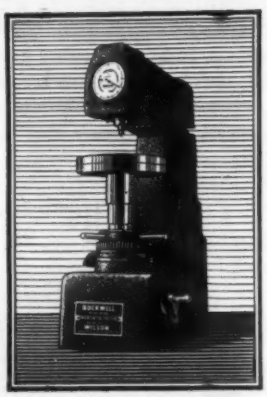
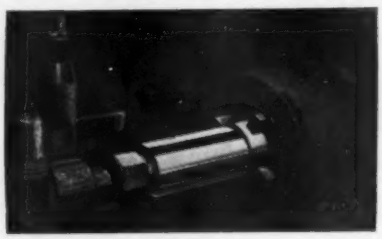


★ *Modern, Versatile* **NICHOLSON**



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OFFER tremendous advantages and enormous savings. Precision products that save time and improve efficiency.

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Other Products: Arbor Presses, Control Valves, Steam Traps, etc.

This improved cutting oil

gives longer tool life

and better finishes on nonferrous metals —

GULF CUT-AID

This revolutionary Gulf Cutting Oil is setting new standards of machine tool performance in hundreds of plants

Gulf Cut-Aid *consistently* shows better results in cutting aluminum and other nonferrous metals!

Here's a typical case:

Operation—machining forged aluminum fuse bodies for high explosive shells.

Result with Gulf Cut-Aid—increased production, longer tool life, and much better finish.

In addition to its superior performance in cutting nonferrous metals, Gulf Cut-Aid has another important function—it is an effective energizer for other cutting oils, regardless of type or viscosity. Blended in varying proportions depending upon the various requirements of the job, the use of Gulf Cut-Aid with other cutting oils makes possible higher production speeds and results in improved finish, longer tool life, or both.

Call in a Gulf Service Engineer today and let him show you how Gulf Cut-Aid and other Gulf quality cutting oils can help improve *your* machining practice.

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Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a 45-page Machining Guide.

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TREAT 'EM RIGHT

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air. . .may be costing you plenty!

The air in your plant may be costing you plenty. Air-borne particles, 100 times smaller than the eye can see, cause shutdowns, ruin products, contaminate atmospheres and reduce the efficiency of your employees.

Conventional air cleaners can't remove these microscopic particles. But Westinghouse PRECIPITRON, cleaning air electrostatically, traps particles as small as 1/250,000 of an inch . . . even removes haze, welding fumes, tobacco smoke.

Really clean air is vital to production . . . to good working conditions and good health. Check the advantages of PRECIPITRON now . . . for war production or for early postwar uses in other fields. Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

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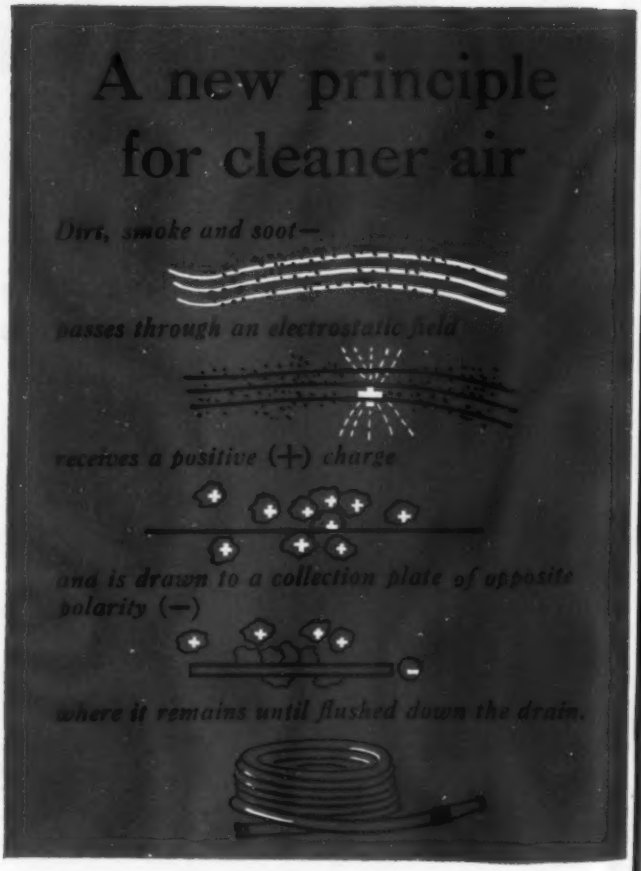
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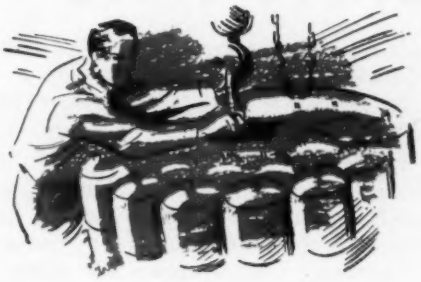
Dirt, smoke and soot—
passes through an electrostatic field
receives a positive (+) charge
and is drawn to a collection plate of opposite polarity (—)
where it remains until flushed down the drain.

Westinghouse Precipitron

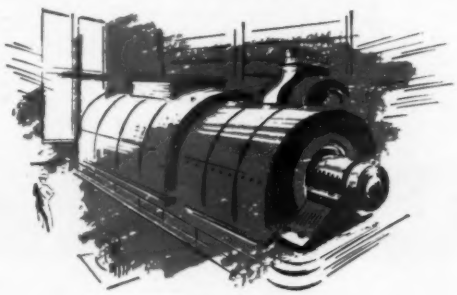
PLANTS IN 25 CITIES OFFICES EVERYWHERE

Precipitron *Applications*

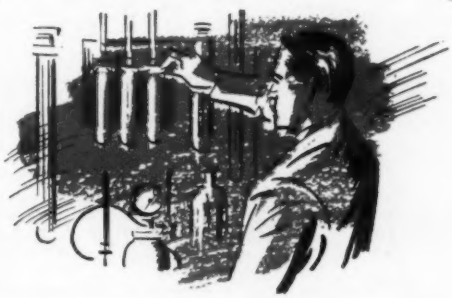
MACHINERY & PRECISION INSTRUMENT PLANTS . . . Precipitron sweeps the air clean of tiny abrasives and corrosive particles that damage superfinished surfaces. In binocular assembly for example, Precipitron prevents dust from entering the enclosure between lenses which would later settle on lens surface.



TEXTILE MILLS . . . Installed in mills as part of the air humidifying and distributing system, Precipitron removes damaging particles before they soil yarn or thread. All smoke, dirt, soot and dust is banished during drying, spinning, and winding operations. Precipitron operation is simple . . . noiseless.

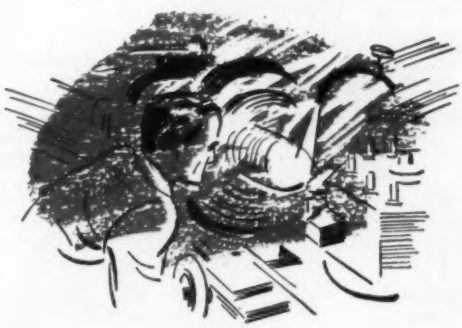


STEEL MILLS—POWER PLANTS—SUBSTATIONS . . . Precipitron effectively reduces maintenance shutdowns by eliminating the excessive dirt on machine windings which causes temperature rises and fires . . . prevents electrical breakdowns caused by leakage over the surface of dirty insulation . . . keeps machine ventilating systems dirt free.



CHEMICAL PLANTS . . . In plants where microscopic specks can cause imperfections in products and processes . . . or wherever miasma-free conditions are essential . . . Precipitron is a necessity. For example, Precipitron is being used in military photographic labs where a speck of dust might hide a Nazi factory in an aerial photo.

LABORATORIES . . . Regardless of outside air conditions, laboratories equipped with Precipitron enjoy perfectly cleaned air. The risk of errors in analysis . . . damage to sensitive equipment . . . threat to manufacturing or assembly operations due to dirt-laden air is positively eliminated.



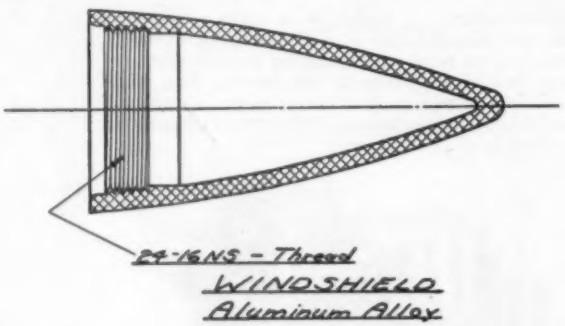
MACHINE TOOL INSTALLATIONS . . . Oil mist caused by high-speed cutting, grinding and machining is dispelled by Precipitron. Condensation of oil on lighting fixtures and bus ducts is eliminated . . . oil coolant can be recovered for re-use. Exhaust air is cleaner than surrounding shop air and can be re-circulated.

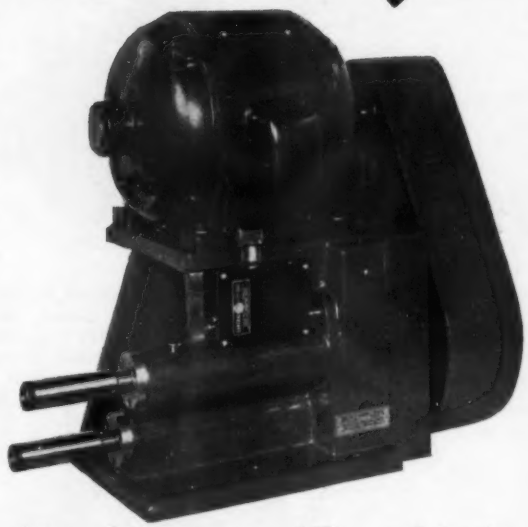
the Electronic Air Cleaner WESTINGHOUSE

HOEFER has a solution for your accurate hole tapping needs! . . .

● The two spindle reversing motor driven Tapping Unit was a part of a 4-station Indexing Machine working on aluminum windshields for shells. Loading took place in Station #1, machining operations in Stations #2 and #3, while in Station #4 the tapping operation shown took place.

As the lead screws were hardened and then ground from the solid, class fits up to 3 can easily be secured. Lead screw tapping assures quick work, accurate threads, proper lead, no stripping, a dependable produce, piece after piece, no scrap.





Let us figure on your drilling and tapping problems on production work.

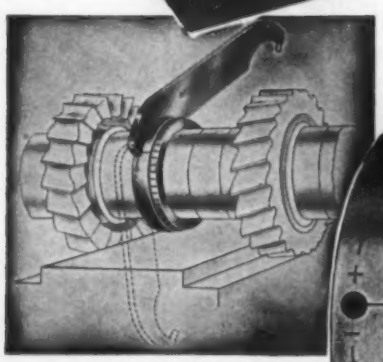
Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

FAST, ACCURATE SPACING

for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

are made in 11 standard sizes for cutter arbors from ⅜" to 3".



You have .0005" plus or minus (up to ½" maximum) at your fingertips with Dayton Rogers ADJUSTABLE SPACING COLLARS. Graduated in thousands, you can make an accurate, positive adjustment in a hurry—just by loosening cutter arbor nut. Result: saved set-up time for increased production.

Try it! You'll never want to run any gang or multiple milling without them again. Write us today, giving name of dealer or supply house.

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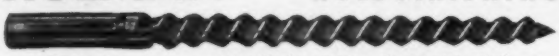

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Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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5 in., 6 in. and 7 in. sizes
All parts Interchangeable

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NO LOST MOTION

when indexing work held between centers on a universal milling machine.

Sliding ball and socket universal joint eliminates binding or cramping and assures accurate spacing.

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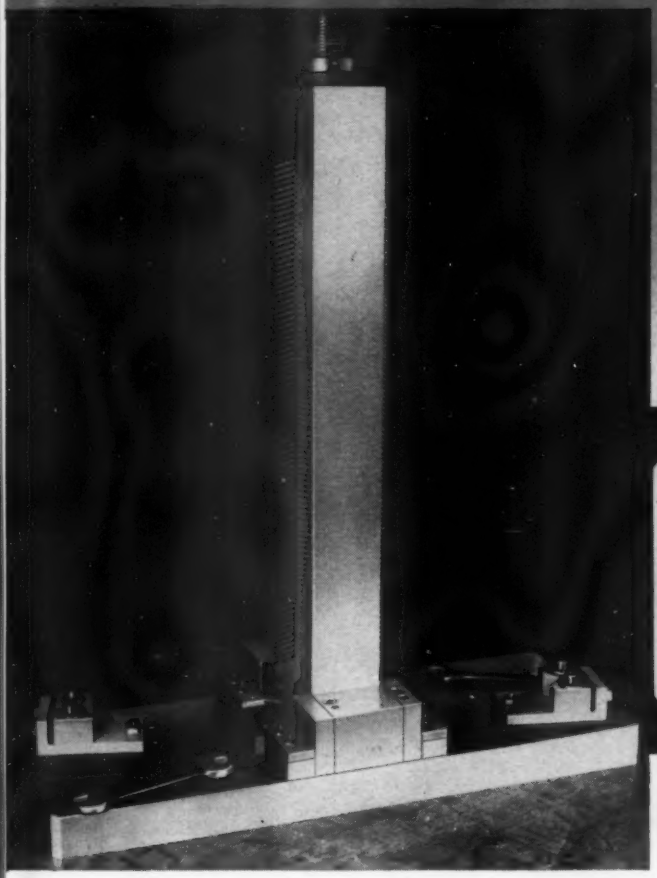
ON SHORT OR LONG RUNS

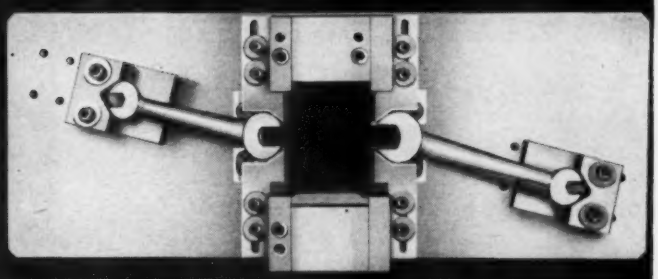
with

★ Inexpensive tools

★ Simple fixtures

★ Use of existing equipment





The photographs above show a Detroit Broach set-up for broaching the jaws of open end wrenches on a hydraulic press. No clamping is required and the locating blocks are adjustable to accommodate different wrenches. Broach inserts for different jaw sizes are easily interchangeable.

Although broaching was developed as a high production operation it can, through proper application, be used on small runs. Many jobs require only the simplest of tools and fixtures, such as those shown above. The work can be done on a simple hydraulic press such as is found in nearly every shop. Where different parts require similar operations it is often possible to provide the fixture with interchangeable pads so that several parts may be broached in the same general set-up.

There is a place for broaching in every shop. If you are looking for more speed, better finish, greater accuracy . . . and lower production costs . . . call on Detroit Broach Company. We will supply you with complete production and cost data without obligation.

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DETROIT BROACH COMPANY

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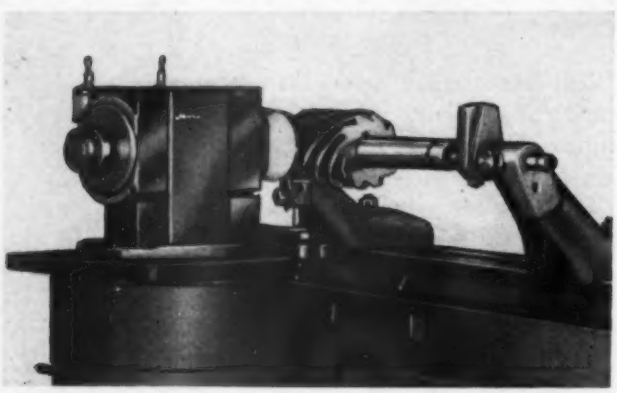
Salvage those worn-out tools--

With a little ingenuity, worn-out tools often can be converted to new and different uses on the Covel No. 22 universal cutter and tool grinder, saving not only materials, but time and money as well.

The No. 22 puts sharp, fresh cutting edges on worn tools and cutters, trimming away a minimum of the precious tool steel, now more valuable to the nation than gold.

COVEL CAN GIVE YOU PROMPT DELIVERY ON THE NO. 22. Write for Bulletin A-74.



Accurate edges on spiral milling cutters, reamers, and other tools are ground with No. 22 high-precision adjustments, trimming away a minimum of metal and assuring long life to your equipment.

Ask for the newly printed Covel instruction book on cutter and tool grinding. Price $1.

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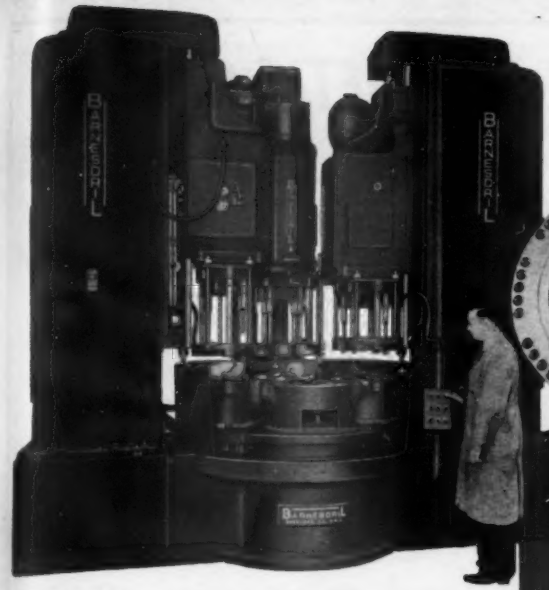
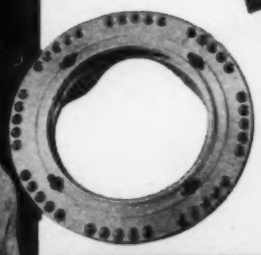
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.





1 Used Vertically with Automatic Indexing Table

This BARNESDRIL No. 10, 3 UNIT, Hydraulic Production Machine with a 4-station rotating indexing table, shows how these Hydraulic UNITS will save many extra operations when arranged around an indexing table for progressive operations. This machine performs simultaneous drilling, reaming and counterboring operations on the inner circle of holes on the aluminum pump housing part shown at left. Uninterrupted production is obtained by using an automatic indexing table with a spare loading station. Our patented hydraulic decelerated control is used for hydraulically positioning table.

3 WAYS

BARNESDRIL

Standard Hydraulic Units are Adapted for Special Drilling, Reaming and Tapping Operations

2 Used Horizontally

Shown here is a BARNESDRIL No. 10 Self-Contained Hydraulic Production Machine using one standard UNIT. Equipped with an 8-spindle auxiliary head, this machine faces and counterbores 8 bosses simultaneously on airplane engine parts.

3 Used in Angular Position

Two standard units are used on this BARNESDRIL No. 10 Hydraulic Production Machine for drilling and counterboring 12 holes in propeller shafts. Each unit is arranged to give rapid approach, slow feed, and rapid return.

3 Sizes Available

These new units are regularly available in the following three sizes, motorized according to the requirements of the job:

No. 5 Unit . . . . . with 5 to 7½ hp. Motor.
No. 10 Unit . . . . . with 10 to 15 hp. Motor.
No. 20 Unit . . . . . with 20 to 25 hp. Motor.

Find Out How You Can Adapt These Machines to Your Work Send today for complete details and specifications of these new drilling UNITS. There is no obligation.

Barnes Drill Co.

A830 CHESTNUT STREET
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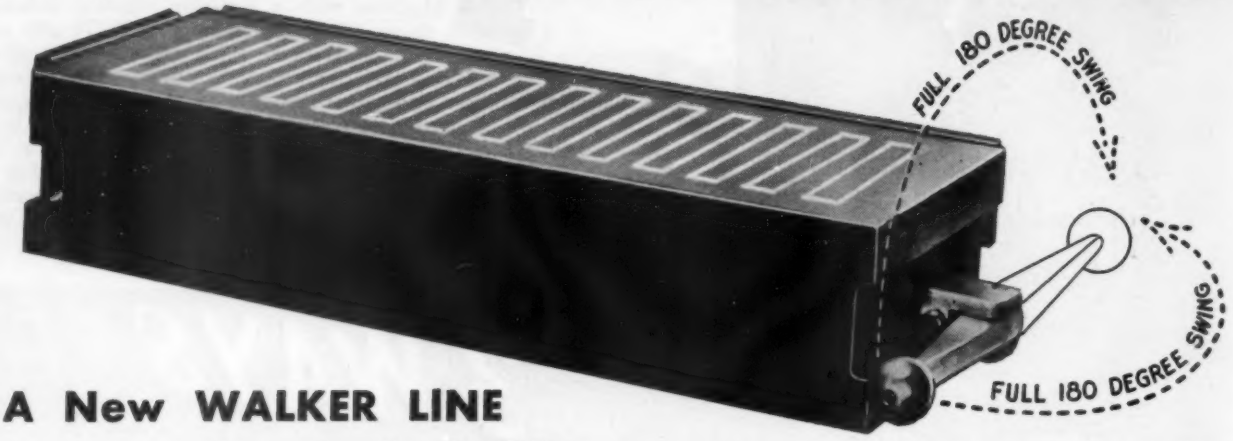
ANNOUNCING—*PERMANENT MAGNETIC CHUCKS*



A New WALKER LINE
. . . greater in holding power and magnetic area

This new line of Walker Magnetic Chucks is the result of more than half a century's specialized experience in developing, designing and building Electro Magnetic Chucks. These new chucks, energized by the latest Walker method, can be depended on to retain their holding power indefinitely. Furthermore greater holding power is attained and a more effective magnetic area achieved through finer pole divisions and more magnetic surface.

Walker PERMANENT Magnetic Chucks are available for quick shipment in several standard sizes. Top plate design can be furnished in several different divisions thereby enabling Walker to supply the one best suited for holding your work. We are also prepared to design and build chucks for special applications.

If you are interested in time and cost savings as well as greater convenience and accuracy—write at once for complete details of the Walker line.

O. S. WALKER CO., INC. **WORCESTER, MASS., U. S. A.**

UNIVERSAL COLLET CHUCKS

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

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There are idlers and idlers. Some are no good to themselves or anyone else. But, when the simple change over of a polishing lathe to use of abrasive cloth belts by installing an Idler Backstand increases production as much as four times—that's worth looking into.

At the wheel: scientifically controlled abrasive cloth cuts faster, cooler, and more uniformly than a set-up wheel; dissipates heat through a constantly changing cutting surface; reduces your loss of polishing grain; makes changes of the fifteen available grit numbers a matter of only a few seconds—slip one belt off, another on.

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Our Field Engineers are thoroughly equipped to explain the distinctive features of various Idler Backstands now on the market, so easily adaptable to this faster, better, modern method of finishing—the use of technically controlled abrasive cloth.

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QUALITY ABRASIVES

BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)

Reliable Coated Abrasives Since 1872

Announcing-

THE NEW SUPER

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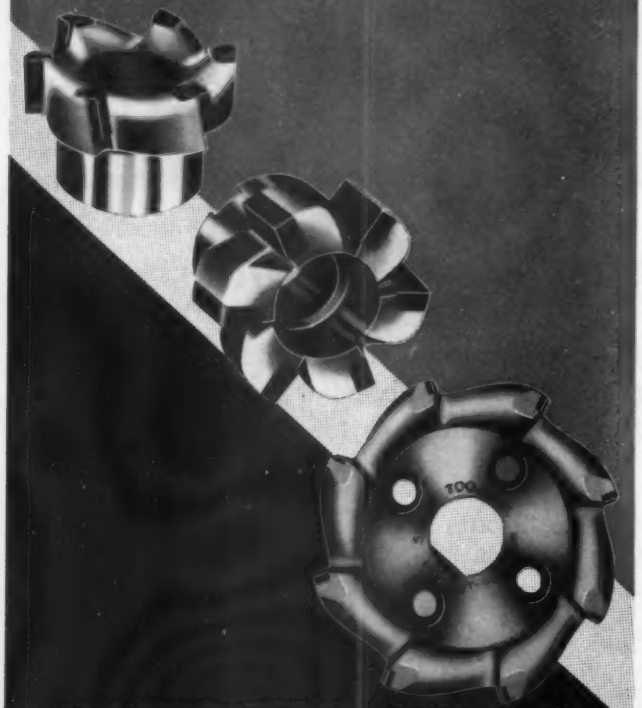
CARBIDE TIPPED

SHELL END MILLS AND FACE MILLS!



Another step forward in Carbide Tipped Standardization!

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Write TODAY for literature, prices and complete details of these Super quality, Super economical Carbide Tipped Cutters.

SUPER TOOL COMPANY

Carbide Tipped Tools

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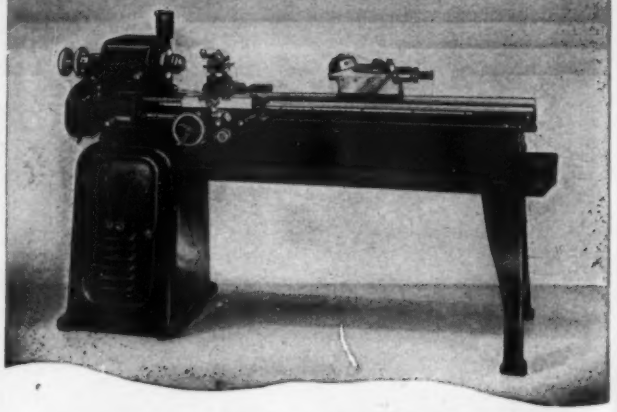

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Best known as quality tool room lathes, SHELDON Precision Lathes are also ideally suited for much second operation and other production work because of their extra collet capacity, sturdy construction, accuracy and available production features including: Lever operated Bed Turret, or Tool Post Turrets, Lever operated Collet Attachments, Tailstocks, Double Tool Posts, 4-speed underneath motor drives, etc. If you are looking for a 10", 11" or 12" Precision Lathe for the Tool Room or Production Line, be sure to see the SHELDON Lathe before you order.

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ADJUSTABLE LIMIT

SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

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Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

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EQUIP YOUR MACHINES with high quality cutting tools
—that's the way to get accurate, dependable work under the heaviest production schedules.

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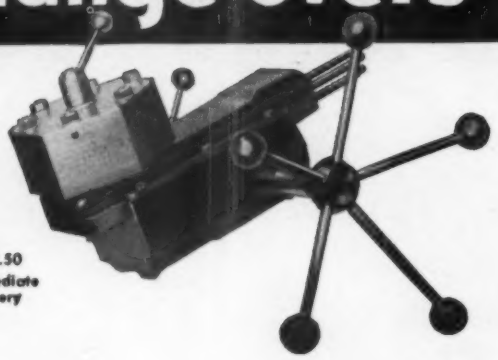
for QUICK change-overs



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Immediate Delivery

UTILITY TOOLS

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Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

$55.00

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Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature.

UTILITY TOOL and DIE MFRS.

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Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.

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for rigid inspection of a wide range of parts . . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch; height 9¼"; weight 5 lbs., 1¾ oz.; depth from frame to spindle 1⅜".

Can be supplied with sliding head and table; also on a stand with throat 3" deep.

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4-Tool Tool-Post Turret

Convert your engine lathe into a turret lathe in 15 seconds. To fit Bench lathes and lathes up to 24" swing. Designed to increase production. 6 DAYS DELIVERY.

The 4-Tool Tool-Post Turret is made in 2 sizes. The 5-Tool Tail-Stock Turret is made in 4 sizes. Also Adjustable Pull Feed—easily attached. All tools are precision attachments. Write for further details.

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"Jefferson Turrets are real production tools — substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market."

Also — Jefferson Precision Milling Machines, Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles

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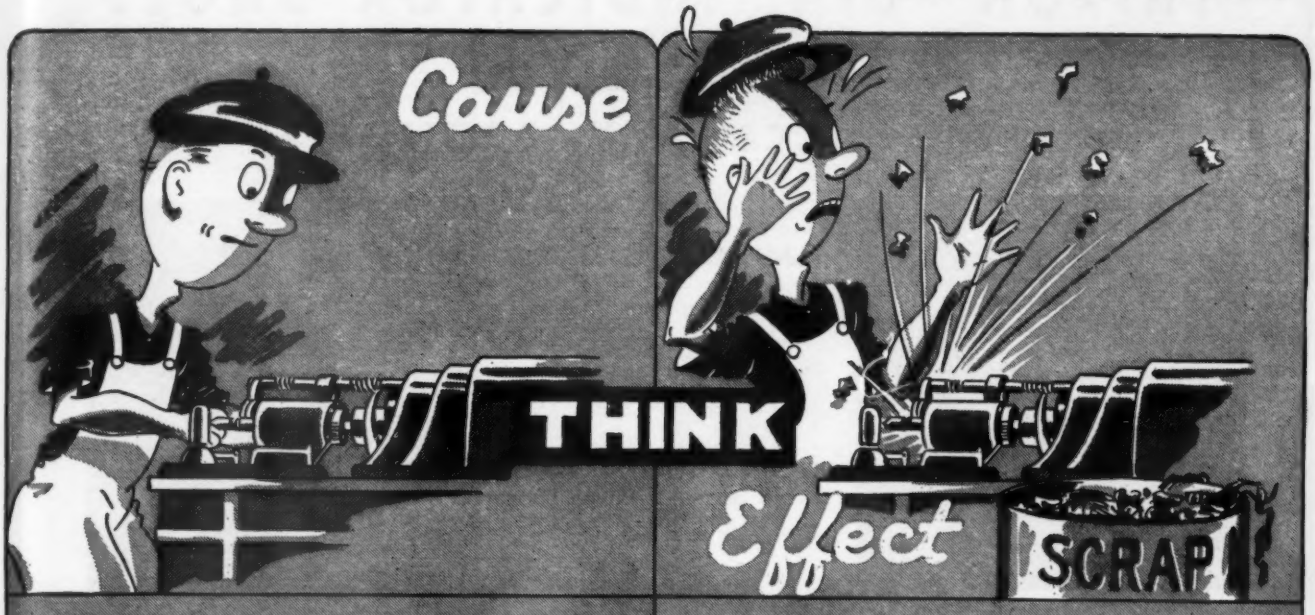
"SCREWBALL" tries to thread close to a shoulder!

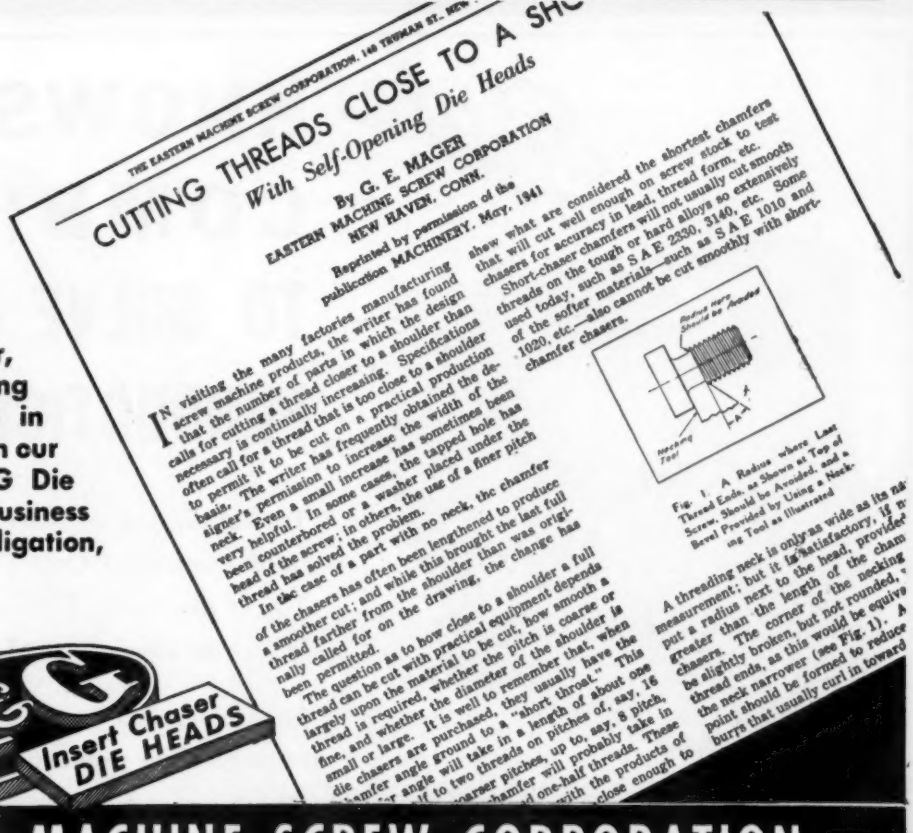


SCREWBALL never thinks to FIRST TRY THE TRIP before threading close to a shoulder.

RUINS A SET OF CHASERS—Because Die Head jams against the shoulder.

IF

Jobs calling for threading close to a shoulder cause headaches, send for this paper by G. E. Mager, member of our engineering staff. Originally printed in Machinery and reprinted in our house magazine, H & G Die Headlines. Just a note on business stationery. There's no obligation, no follow up.



THE EASTERN MACHINE SCREW CORPORATION, 140 TRUMAN ST., NEW...

CUTTING THREADS CLOSE TO A SHO...
With Self-Opening Die Heads

By G. E. MAGER
EASTERN MACHINE SCREW CORPORATION
NEW HAVEN, CONN.

Reprinted by permission of the publication MACHINERY, May, 1941

IN visiting the many factories manufacturing screw machine products, the writer has found that the number of parts in which the design calls for cutting a thread closer to a shoulder than necessary is continually increasing. Specifications often call for a thread that is too close to a shoulder to permit it to be cut on a practical production basis. The writer has frequently obtained the designer's permission to increase the width of the neck. Even a small increase has sometimes been very helpful. In some cases, the tapped hole has been counterbored or a washer placed under the head of the screw; in others, the use of a finer pitch thread has solved the problem.

In the case of a part with no neck, the chamfer of the chasers has often been lengthened to produce a smoother cut; and while this brought the last full thread farther from the shoulder than was originally called for on the drawing, the change has been permitted.

The question as to how close to a shoulder a full thread can be cut with practical equipment depends largely upon the material to be cut, how smooth a thread is required, whether the pitch is coarse or fine, and whether the diameter of the shoulder is small or large. It is well to remember that, when die chasers are purchased, they usually have the chamfer angle ground to a "short throat." This angle will take in a length of about one and one-half threads on pitches of, say, 16 to two threads on pitches up to, say, 8 pitch, coarser pitches, up to, say, 8 pitch, chamfer will probably take in with the products of close enough to shew what are considered the shortest chamfers that will cut well enough on screw stock to test chasers for accuracy in lead, thread form, etc.

Short-chaser chamfers will not usually cut smooth threads on the tough or hard alloys so extensively used today, such as S A E 2330, 3140, etc. Some of the softer materials—such as S A E 1010 and 1020, etc.—also cannot be cut smoothly with short-chamfer chasers.

Fig. 1. A Radius where Last Thread Ends, as Shown at Top of Screw, Should be Avoided, and a Bevel Provided by Using a Neck-ing Tool as Illustrated

A threading neck is only as wide as its ra... measurement; but it is satisfactory, if n... put a radius next to the head, provided ... greater than the length of the chan... chasers. The corner of the necking ... be slightly broken, but not rounded, ... thread ends, as this would be equiva... the neck narrower (see Fig. 1). A ... point should be formed to reduce ... burrs that usually curl in toward ...

H&G Insert Chaser DIE HEADS

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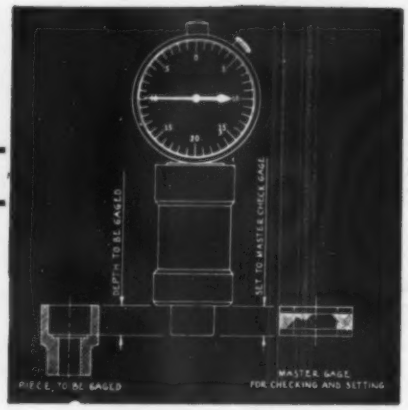

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MINIMUM OF REJECTIONS

Inasmuch as the Indicator requires no toolmaker's tolerance.

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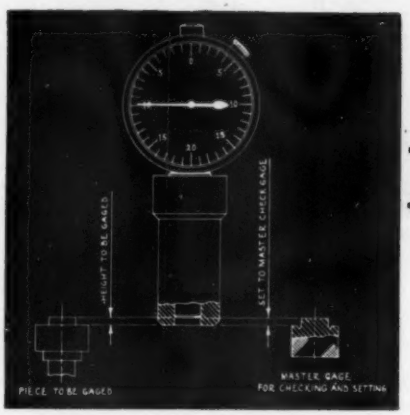
Send us a print of the part to be gaged, or dimensions noted on the drawings.

U. S. Patent No. 2,334,128



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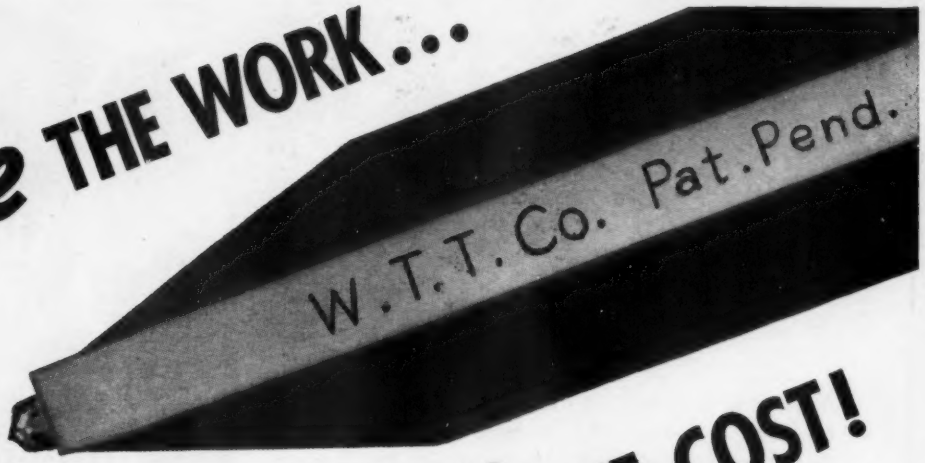

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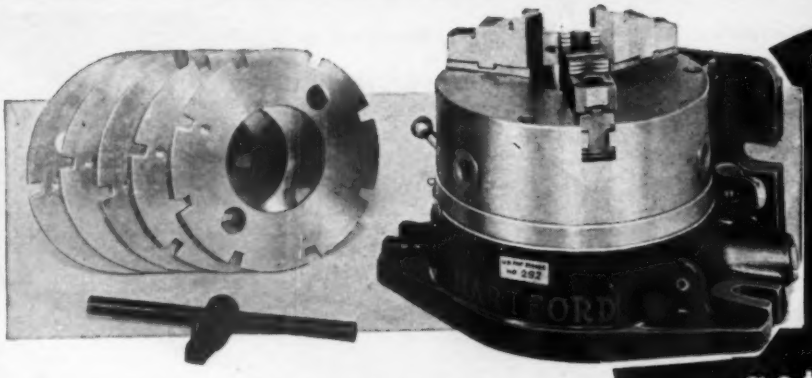

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A comparison will help do this quickly.

You probably are familiar with blueprinting—with its water and potash baths, driers, plumbing connections, and multiple controls.

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1. You can use a complete line of papers, cloths, and foils—an impossibility with "wet" or "semi-dry" methods.

With Ozalid you can produce prints having black, blue, or maroon lines on a white background.

You can make transparent duplicates which may be used . . . in place of valuable originals in subsequent print production . . . or by draftsmen to save time when making design changes.

And you can reclaim soiled or worn originals by making foil duplicates.

2. You process all Ozalid materials in the same manner. No solutions to change. No "stops" in production.

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How to Save Time, Labor, and Materials

If you have already installed expensive blueprinting equipment, you can add an Ozalid Dry Developing unit which, when used with your present printer, will give you all of Ozalid's advantages.

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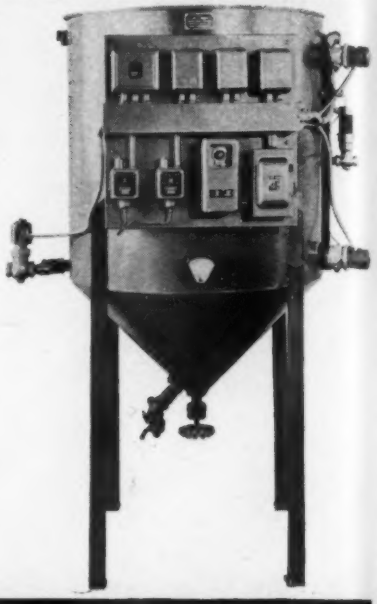
By thoroughly and constantly sterilizing and effectively removing solid matter, the Barrett Combination Sterilizer and Sedimentor reconditions cutting oil for reuse; sterilized for safety's sake and abrasive-free for longer tool life.

Barrett Sterilizer and Sediment Precipitator arranged for fully automatic operation.



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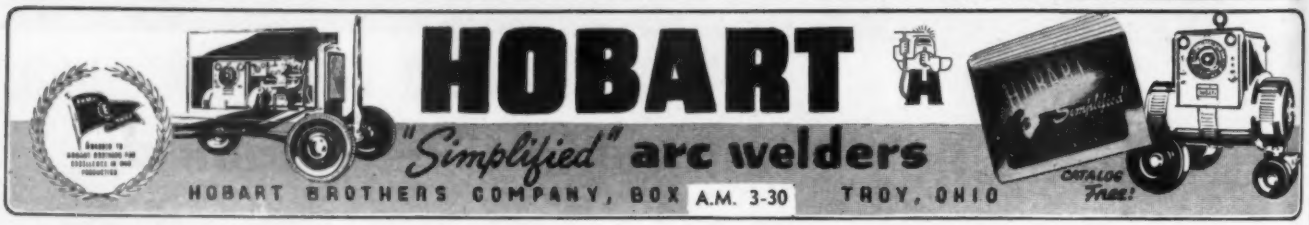

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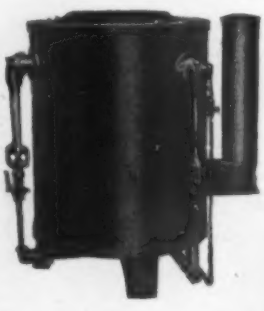

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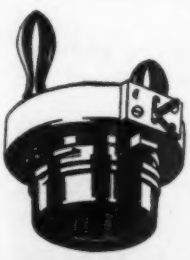

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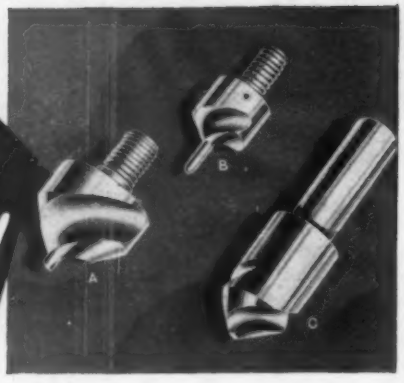

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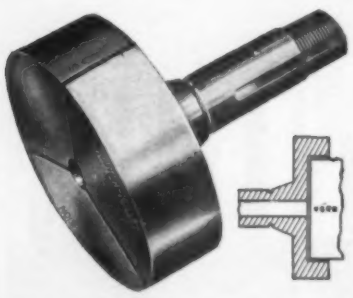

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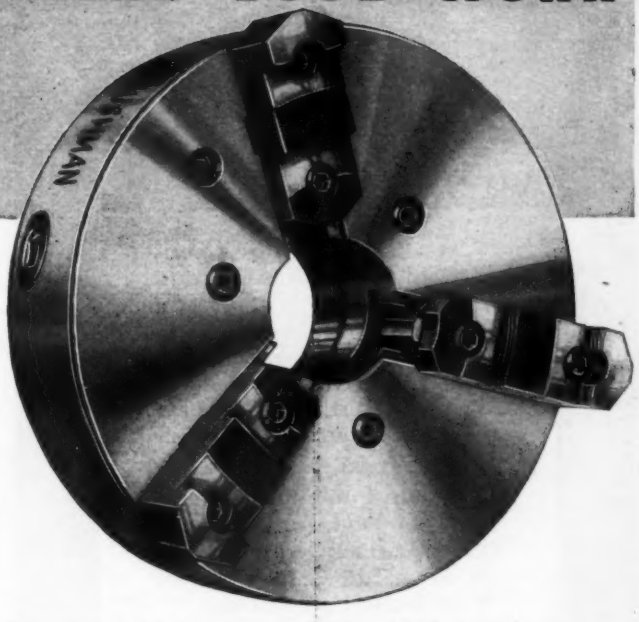

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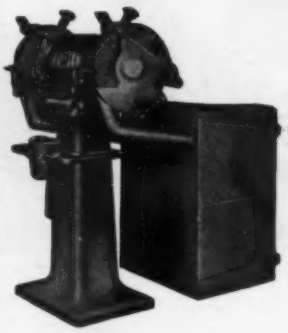

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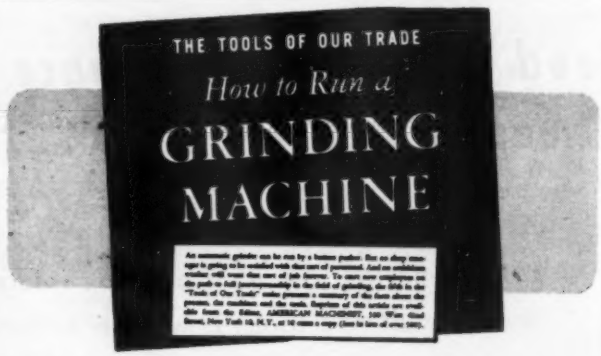

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• Special Tools and Fixtures,
• Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

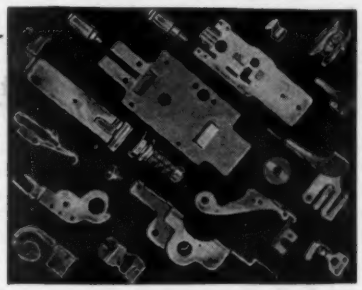
Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS

Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.
We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.
Quality work by skilled mechanics is assured. Send your blueprints or samples today.

"GREATER SAVINGS WITH GREIST"



THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

TANK AND SHEET METAL WORK

We are equipped to manufacture to your specifications tank work, such as storage tanks, pressure tanks, etc. Our welders are experienced in welding steel, stainless steel, Monel metal and Everdur; also brazing of all descriptions. They are certified for welding under the ASME Code Unfired pressure vessels. We also have certified Navy Aeronautical welding under certain specifications. Send your blueprints for prompt quotations.

BOWSER, INC.
1302 E. CREIGHTON FT. WAYNE 5, INDIANA

Additional Contract Work Advertising on page 220

GEAR BLANKS

WE CAN MAKE QUICK DELIVERY ON YOUR GEAR BLANKS

Send Us Your Prints for Quotation

PRECISION MOTORS COMPANY, 130-35 91st Ave., Richmond Hill 18, N. Y.

SEARCHLIGHT SECTION

WANTED

SUPERINTENDENT — GEAR SHOP

Complete charge of Gear Cutting Department. Experienced in helical, herringbone and spiral bevel gears, shaping, hobbing, shaving and grinding. Also worm cutting and grinding and tangential feed hobbing. Wide diversification precision gear work, medium size range. Long established Northern New Jersey Company. Reply must give full particulars. Write

P-793, American Machinist

330 West 42nd St., New York 18, N. Y.

WANTED

METAL SPECIALIST

Man with thorough knowledge of metals and broad experience in metal manufacturing and finishing processes. Wanted to work with present well-established technical and service organization which manufactures cleaning, cutting and grinding materials. Our products are extremely essential in all kinds of production, processing and maintenance work. Must be willing to travel. Give details regarding experience, age, salary, marital and draft status. Do not reply if engaged at full skill. Replies are treated confidentially.

P-799, American Machinist

330 W. 42nd St., New York 18, N. Y.

WANTED—SHOP SUPERINTENDENT

Experience in manufacture of pneumatic rock drills and paving breakers desirable. Midwest plant now engaged in war production, planning post-war expansion. Permanent position for the right man.

P-798, AMERICAN MACHINIST

520 North Michigan Ave., Chicago 11, Ill.

Wanted — WORKS MANAGER

Long established well known Southern California Manufacturer of Electric Motors and electric power apparatus specialties wants factory manager experienced and capable in this line of work—Post war business prospects excellent—Unusual opportunity for right man—Your present employer will not be contacted unless authorized—Give full details in first letter.

P-797, AMERICAN MACHINIST

68 Post St., San Francisco 4, California

WANTED

CHIEF INSPECTOR

With background of experience in planning and organizing daily work. Thorough knowledge of all phases of machine parts and casting inspection. Old established concern with excellent post war prospects.

P-796, AMERICAN MACHINIST

520 North Michigan Ave., Chicago 11, Ill.

WANTED

ASS'T. CHIEF INSPECTOR

Must have background of machine parts and casting inspection along with supervisory qualifications. Established concern with excellent Post War prospect.

P-794, AMERICAN MACHINIST

520 North Michigan Ave., Chicago 11, Ill.

WANTED

SUPERINTENDENT

for Grinder Division. Landis, Norton, centerless, vertical and horizontal Hones. Must be fully qualified on all types of grinding and possess organizational and Supervisory qualifications. Old established concern with excellent Post War prospect.

P-795, AMERICAN MACHINIST

520 North Michigan Ave., Chicago 11, Ill.

WANTED — TOOLMAKER

who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1933. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.

P-701, AMERICAN MACHINIST

330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL ENGINEER and Designer, to work out details of mechanical devices and make them effective. P-774, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION AND SALES ENGINEER, to develop and head a Light Punch Press Products Business, to be based upon a new, highly productive Punch Press. Must be a practical resourceful production man with sales and executive ability. P-775, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PERMANENT POSITIONS OPEN for Tool Design Engineers, Tool Makers and Draftsmen. Old well-established Midwest Manufacturer of threshers, combines, and corn pickers with national distribution through Ford-Ferguson Tractor and Implement Dealers. Good postwar future assured. Salary open. Write experience, qualifications, draft status, and other particulars in your first letter. If presently employed at your highest skill in essential industry, do not apply. Address Irwin Ray, Personnel Director, Wood Bros. Thresher Co., Des Moines, Iowa.

COST ESTIMATING EXPERT familiar with cams and tool layouts, for position as assistant to department head in large, progressive automotive, refrigeration, and plane parts industry. Several years practical experience necessary. Hand and automatic screw machine background preferred. Must be over 38 or draft deferred. P-800, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED—Middle western firm of 26 years standing offers permanent position to engineer capable of cam layout work for Brown & Sharpe Automatics. State age, draft status, experience, availability and salary expected. P-801, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 24 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITIONS WANTED

ENGINEER, age 53, experienced in machine methods for low cost production and the development of product design desires a connection with a firm having a post war program. Competent to organize, train, and supervise. New York State preferred. PW-776, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED—connection as consulting or research engineer, preferably in Eastern part of country. Age 38, degree in mechanical engineering plus ten years experience in the development of metal working machine tools, ordnance, automobiles and farm tools. Draft classification I-C. Would consider partnership in engineering organization. PW-802, American Machinist 520 N. Michigan Ave., Chicago 11, Ill.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OFFERED

SALES ENGINEER WANTED—To sell and service precision automatic screw machine of general Swiss principle of design. Manufactured by large prominent concern. Several hundred machines in successful operation in the U.S.A. Experience in selling, practical and theoretical knowledge of automatic screw machines are essential. Permanent well paid position for right man. SW-803, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED

MACHINIST

Experienced in small tool, jig and fixture making and the construction of experimental and development models. Experience in setup work in small production machine shop helpful.

Permanent position in rapidly expanding plant in Downtown Manhattan to draft exempt or ex-service man.

Write, stating age, service status, education, experience, references, and compensation expected.

P-804, AMERICAN MACHINIST

330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915, Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

CONTRACT WORK

WORK WANTED—For advertisements of work wanted see pages 219 and this page.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

CONTRACT WORK

(Continued from page 219)

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also stepgrinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange, N.J.
(Makers of J.&S. Radil & Angle Dressing Tools)

WIRE AND METAL SPECIALISTS

in round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing.

EASTERN TOOL & MFG. CO.

BLOOMFIELD, N. J.

New "SEARCHLIGHT" Advertisements

must be received by 10 A. M. Thursday to appear in the issue out Thursday of the following week.

Address copy to the Departmental Staff

American Machinist
330 West 42nd St., New York City

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery

48" GISHOLT VERTICAL BORING MILL

BORING MILLS

48" Gisholt Vertical Boring and Turning Mill.
52" Colburn Boring and Turning Mill.
8¼" Bar, Landis, Floor Type; Floor Plate 120"x72"; Range—60" Longitudinal Travel, 60" Vertical Travel, 26" Spindle Travel at one Setting.
40" Colburn Vertical Boring Mill, Self-Contained.
42" Bullard "New Era" Vertical Turret Lathe.

MILLING MACHINES

No. 3 Cincinnati Vertical High Power Miller, Motor Driven; Power Rapid Traverse, Serial A 308-E; Range 34" Longitudinal Travel, 12" Transverse, 20" Vertical; Thoroughly reconditioned; immediate delivery.
AMES Precision Universal Bench Mill.
No. 1 Kempsmith Universal Mill
No. 1 Cleveland Vertical Miller.
No. 2 Pratt & Whitney Duplex Production Miller, Belt drive and countershaft.
No. 1 U. S. Hand Miller, motor driven.
No. 12 Pratt & Whitney Profiler.
No. 1½ Valley City Plain Miller, belt drive.
PRATT & WHITNEY 2" Spline Duplex Miller
1—No. 4 Cincinnati Plain Miller, high power, Serial #A-703-D.
#5 Cincinnati High Power Plain Milling Machine, single pulley motor drive with power rapid traverse.

HEAVY PRODUCTION FOLDER NIAGARA #98

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) ¾" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

HAMMERS

High Speed Riveting Hammers, all sizes in stock from 6 A to AA 1
1100 lb. Niles Steam Forging Hammer.
50 lb. Fairbanks Blacksmith Forging.
16 lb. Bradley upright strap Hammer.

GRINDERS

#4 Gallmeyer & Livingston Universal Tool and Cutter Grinder. Motor Drive with Wet Attachment.
#2 Cincinnati Centerless Grinder
24" x 136" Landis Universal Cylindrical Grinder, motor drive, perfect condition, rare bargain.
Pratt & Whitney 14" x 36" Vertical Surface Grinder, ball bearing spindles, belted motor drive, 10" x 36" magnetic chuck.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
#2 Brown & Sharpe Universal Cylindrical, belt drive
18" Gorton Disc Grinder, double end, B.D.
12" x 2" New B-line Floor Grinders, 3 H.P., 3-60-220/440.
Marschke 24" x 3" Swing Frame Grinder, 20 H.P., AC motor.

GEAR CUTTING MACHINERY

No. 13 Brown & Sharpe Spur & Bevel Gear Cutter.
No. 612 Fellows Gear Shapers, large hole in spindle. Exceptionally fine condition.
#6 Fellows Gear Shaper, belt drive, Serial #4221.

PLANERS

POND 72" x 72" x 18' table; 2 heads on rail, 2 side heads.
CINCINNATI 30" x 30" x 10' table, M.D.
PUTNAM 48" x 48" x 12' table, M.D.
Gray 26" x 26" x 8' Double Housing Planer, single head on cross rail, belted motor drive.
Cincinnati 24" x 24" x 6' table, belt drive, single graduated swivel head on cross rail.
American, 30" x 30" x 12', A.C. Motor Drive, two heads.

Betts Planer, 120" between uprights, 72" under rail, 35' table. Equipped with four heads and arranged direct motor drive with D.C. 50 H.P. reversing type motor and controller. Perfect condition. Immediate delivery.

SHAPERS

26" Cincinnati, Triple Geared, friction drive.
24" Gould & Eberhardt High Duty Back Geared Crank Shaper.
20" Gould & Eberhardt High Duty Back Geared Crank Shaper.
16" Davis Back Geared Crank Shaper, single pulley drive.
7" Rhodes Shaper.
American 6' arm Plain Radial Drill.

Cincinnati-Bickford Radial Drills, 4' and 5'arm, motor drive.

DAVENPORT AUTOMATIC SCREW MACHINE

Model B High Speed. 5 Spindle 9/16 round capacity. With Threading Attachment.

LANDIS UNIVERSAL CYLINDRICAL GRINDER

Size 24" swing x 136" between centers. Motorized, motors, 3 phase 60 cycle 220-440 Volt. Complete with Tank and Pump. Warranted in first class mechanical condition. Will hold long work to very close tolerances. BARGAIN PRICE. Immediate delivery.

LATHES

Rockford 16 x 6 Quick Change Gear, motorized.
LeBlond 14" x 6' Toolroom Quick Change Gear Screw Cutting Lathe with taper attachment, drawbar collets and two chucks.
American 16 x 8 Quick Change Gear, motor drive.
Seneca Falls 14 x 6 Quick Change Gear, motor drive, taper attachment, collets.
Logan Model #450 Turret Lathe, new, ⅝ capacity, immediate delivery.
26" x 12' PUTNAM Heavy Duty, Quick Change Gears, fitted with Raising Blocks to swing 32"; Arranged for direct Geared Motor Drive.
22" x 16' REED "Light Pattern" Plain Change Screw Cutting Lathe, fitted with 12" 4-jaw chuck, standard equipment. $550.00
21" x 16' LeBlond, Heavy Duty Quick Change Gear Screw Cutting Lathe, Motorized 3-60-220, Oil Pan, Taper Attachment, Pump, Chuck and Standard Equipment, Rebuilt, Immediate Delivery.
21" x 8' LeBlond Heavy Duty Geared Head motor driven Screw Cutting, Quick Change Gear, Engine Lathe, with taper attachment, 18" 4-jaw Independent Chuck, standard equipment. Motor Dr.
Monarch 16" x 8' Quick Change Gear Bowl Head, 3 step cone, double back geared with two chucks, taper attachment, standard equipment.
16" x 6' South Bend Plain Change Lathe, 4-step cone, belt drive, standard equipment.
Fitchburgh, LoSwing Lathes 8" x 108". Late type.
10' x 42" Logan New Lathes. $225.00
18" x 12' bed Hamilton Plain Change Gear Screw Cutting Engine Lathe.

Buy From Stock

MACHINERY

Tel. Main 6347-6348

FALK

MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

We Sell Production Machine Tools

So you're going to buy a miller, a press, a grinder, a gear cutter. Before you buy a machine tool of any kind—find out if there's a used tool that would serve your purpose.

For the answer to these and many other machine tool requirements—see an MDNA dealer first before you buy. He will make every effort to find you the right machine for the right job at the right price. Invite an MDNA dealer into your shop—so that he may become familiar with your production problems—and catalogue your needs when he is shopping around for available used machine tools. Your MDNA dealer is interested in you as a permanent customer. Hence he doesn't sell just machine tools. He tries to service your production problems. So before you buy any machine tools—new, used or rebuilt—see what an MDNA dealer has to offer.

LOOK FOR THIS SEAL OF INTEGRITY

MDNA
MEMBER

WHEN BUYING USED OR REBUILT MACHINERY

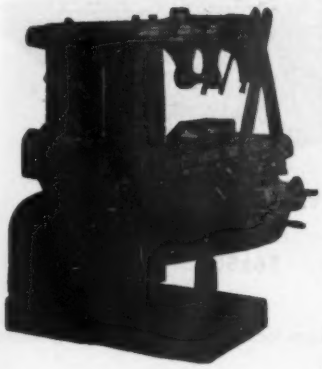
When you see the MDNA seal in the advertising of a used machine tool dealer you have reason to feel unusual confidence in the values which he offers . . . because his display of that seal is public notice that he has subscribed, both in spirit and in letter, to the code of ethics adopted by the National Machinery Dealers Association, an organization of dealers in used and rebuilt machinery.

MACHINERY DEALERS NATIONAL ASSOCIATION

20 NORTH WACKER DRIVE CHICAGO (6) ILLINOIS

AVAILABLE NOW!

MILLING MACHINES



PLAIN

No. 2-S K & T Double Overarm; Motor in base
No. 2-B K & T Dble. overarm
No. 3 CINCINNATI, Rapid trav. S.P.D.; Hi-power
No. 5 CINCINNATI, Rect. overarm, 21"x83" table, M.D.
No. 4 LeBLOND HEAVY DUTY
No. 4 CINCINNATI, Cone Drive, table 16"x68¾"
No. 3 CINCINNATI

UNIVERSAL

No. 3 CINCINNATI, S.P.D.
No. 3 CINCINNATI
No. 1½ HENDEY NORTON
No. 1 KEMPSMITH

VERTICAL

Nos. 3 & 2 B. & S.; No. 5-B BECKER; No. 2½B KEARNEY & TRECKER

THREAD MILLS

6"x48" & 6"x72" PRATT & WHITNEY, No. 3 LEES BRADNER

MILLS — PLANER TYPE & SLAB

44"x40"x10' INGERSOLL PLANER TYPE; Adl. rail; 4 heads
42"x12' INGERSOLL PLANER TYPE; 2 side heads, 1 vert. hd.
42"x42"x13' INGERSOLL SLAB; 1 VERTICAL HEAD, M.D.
42"x36"x6' BEAMAN SMITH OPENSIDE PLANER TYPE, 1 VERT. HD., 1 SIDE HD.

HORIZONTAL BORING MILLS

Practically new 6" GIDDINGS LEWIS, Table Type, New 1942
8" NILES BEMENT POND, Floor type, Extra high column. All geared feeds, M.D. with motor
No. 43 LUCAS, 5" BAR, Table Type, 48"x72" table; M.D. (2)
5" DETRICK HARVEY, Floor Type; M.D., No. 6 M.T.
3½" No. 32 GIDDINGS LEWIS, M.D.; 3" LUCAS, Table type, M.D.
3⅛" No. 0 GIDDINGS LEWIS, Table type, M.D.
2⅛" CLEVELAND; 3½" BEAMAN SMITH
4" KEMPSMITH, 3" MORRIS
SNYDER & FOOTE BURTE 2-Way DRILLING & BORING MACHINES

VERTICAL BORING MILLS

10 FT. POND, 8' dia. table, 7 chuck jaws, Power feed, M.D.
72" & 60" COLBURNS, Geared feeds, Rapid traverse
53" NBP; 51" BULLARD, 48" COLBURN
6" BULLARD MULT-AU-MATIC, 4 stations; M.D., Late type machine

SHAPERS

28" ROCKFORD, Gear Box, M.D.; 28" OHIO, Heavy Duty (2); 7" PORTER CABLE; 15" POTTER & JOHNSTON

FLOOR DRILLS

No. 283 & No. 242 BARNES, 25" & 26" Sliding Head.
36" PRENTICE, 34" BARNES
2 Spindle FOOTE BURT Heavy Duty; 8 Spindle Multiple

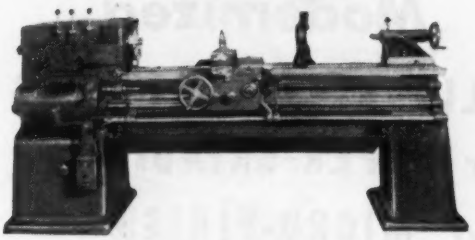
PLANERS

36" SELLERS PLATE PLANER, Pneu. holddowns; Motor Drive
60"x60"x18 FT. WOODWARD POWELL, 4 heads
60"x60"x18 FT. NILES, 2 heads on rail, M.D.
44"x36"x12 FT. GRAY, 2 heads on rail
30"x30"x8 FT. & 24"x24"x6' WHITCOMB

RADIAL DRILLS

5 FT. & 4 FT. REED PRENTICE, M.D.
4 FT. AMERICAN, No. 5 M.T., 11" Column
3 FT. FOSDICK, No. 4 M.T., 10" Column

FLOOR LATHES



NEW 14"x6 FT., 14"x8 FT. ROBBINS GEARED HEAD TOOL ROOM LATHES; Taper attachment; motor in base; motor drive. Prompt delivery—No priority required.
30"x12' LeBLOND, Q.C.G.; 26"x8' BRIDGEFORD, Q.C.G.
16"x6 FT. PRATT & WHITNEY GEARED HEAD
14"x6' CARROLL & JAMIESON
42"x18' NEW HAVEN, 10' centers, Triple Geared, M.D.
30' PIT LATHE, Face plate 156"—PIT LATHE, 86" swing
24"x15" NEW HAVEN; 8" SUNDSTRAND
30" NBP DOUBLE AXLE LATHE

TURRET LATHES

JONES & LAMSON GEARED HEAD, AC MOTOR DRIVE; 2¼"x24", Bar Feed (4); 2¼"x24", CHUCKERS (2); 3"x36". Bar Feed (1); 3"x36", Chucker (1)
4—No. 6-A POTTER & JOHNSTONS
No. 4 WARNER SWASEY, BAR FEED
2—21" GISHOLTS, 5" and 3½" hole
28" NILES BEMENT POND, Gd. Hd., 4½" hole
No. 16 GISHOLT SIMPLIMATICS, 21" and 23" swings; S.P.D.
LODGE & DAVIS, 2-1/16" hole

SCREW MACHINES

2⅛" GRIDLEYS—1 spindle (2); No. 55 NATIONAL ACMES
No. 652 NEW BRITAIN CHUCKER
Nos. 2 & 3 MANVILLE WOOD SCREW MACHINES

GRINDERS

INTERNAL

No. 72 HEALD SIZEMATIC INTERNAL, Hyd. Feed., M.D.
No. 70 HEALD, No. 60 HEALD
No. 52 GREENFIELD HYDROILS, Hyd. Feed, B.B. (2)

CENTERLESS

2—PRACTICALLY NEW ZEPHYR MODEL M-1 Grinding wheel and feed wheel with motors, coolant pump and tank

SURFACE

No. 16A BLANCHARD AUTOMATIC ROTARY
30" Magnetic chuck, 18" wheel
No. 16 BLANCHARD, 26" magnetic chuck, motor drive
15"x15"x96" NORTON, 2 mag. chucks; No. 2 WILMARTH & MORMAN

CYLINDRICAL

14"x72" NORTON, 2"x16" wheel, Power Feed
No. 22 LANDIS; 12x34", Power Feed, Pump & Pan
32"x10'x6" FARREL ROLL GRINDER
Will grind rolls up to maximum of 34" diameters and 10' between centers; 30" WHEEL; with AC motors

UNIVERSAL

No. 13 BROWN & SHARPE, 8" swing, M.D.
No. 2 CINCINNATI; No. 1 LANDIS; BATH

TOOL & CUTTER

No. 1 WILMARTH & MORMAN; No. 103 RIVETT

GEAR MACHINERY

No. 6 FELLOWS GEAR SHAPER 36" capacity
No. 12 BARBER COLEMAN HOBBER
No. 36BT GOULD & EBERHARDT TURRET TYPE BEVEL ROUGHER

MISCELLANEOUS ITEMS

16"x20" WATERBURY-FARREL Type No. 4350 Cold Rolling Mill: Double reduction gear drive;
20 ft. draw bench;
100,000 LB. TESTING MACHINE

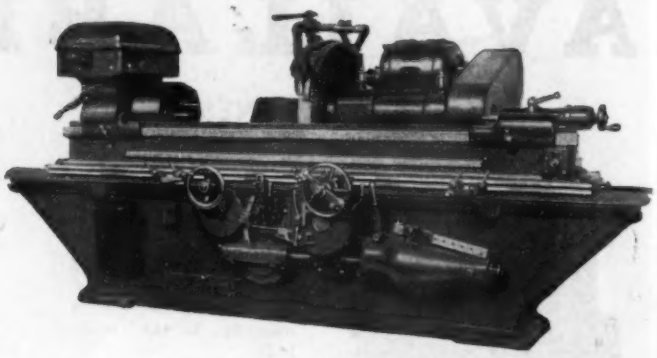
SEND FOR MARCH ISSUE OF "MACHINERY MART"

MDNA MEMBER

INTERSTATE MACHINERY CO., INC.

1439 W. PERSHING RD. TEL. YARDS 5800 CHICAGO, 9, ILL.

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x28	10x50	14x72	16x72
10x36	14x50	16x50	18x96
			18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

SELECTIONS FROM MILES' STOCK

Automatic, 7" Baird 6 spindle
Automatic, 4½" Gridley Model H 4 spindle
Automatic, 14" x 19" Fay
Boring Mill, 3" bar, No. 2-A Universal
Boring Mill, 3⅜" Bement & Smith cylinder
Brake, 10' x 10 ga. Dreis & Krump leaf
Broach, No. 3 double & No. 4 Lapointe
Compressor, 427 Cu. Ft. Chicago steam
Compressor, 550 Cu. Ft. National, elec.
Compressor, 1400 Cu. Ft. Sullivan, elec.
Drill, Multiple, Nos. 11, 12 & 13 Nates
Drill, Sensitive, 30" Henry & Wright No. 2
Drill, Sensitive, Nos. 1 & 2 Avey, 1 & 2 spdl.
Drill, 3¼" American heavy duty radial
Drill, No. 430 Barnes double end
Gear Shaper, No. 21 Fellows (large hole)
Gear Hobber, No. 16 HS Gould & Eberhardt
Gear Hobber, No. 1 Lees Bradner
Gear Hobber, No. 2 Barber Colman
Gear Cutter, 26", & 48 Brown & Sharpe
Gear Lapper, 8" Red Ring
Gear Generator, 12" Gleason bevel gear and bevel pinion
Gear Tester & Lapper, 18" Gleason
Gear Chamferer, No. 4 Peerless
Grinder, 12' x 48" Cincinnati No. 2 Univ.
Grinder, 20' Gardner semi-auto. disc
Grinder, No. 72 Heald electric indicator automatic internal
Grinder, Nos. 50 & 60 Heald cylinder
Grinder, 24" Cincinnati milling cutter
Grinder, 16" x 48" Landis crankshaft
Grinder, No. 2 Cincinnati centerless
Grinder, 12" x 36", 16" x 36" & 16 x 52 Landis
Grinder, 6" x 20", No. 10 Brown & Sharpe
Lathe, 18" x 8' Greaves Klusman QCG
Lathe, 36" x 16' Putnam grd bd, QCG
Lathe, 8" Sundstrand stub
Lathe, 14" Porter Cable
Lathe, Turret, 32" Libby, 4¼" hole
Lathe, Turret, 36" Libby, 4½" hole
Lathe, Turret, 26" Libby, 7¼" hole
Lathe, Turret, No. 3B Foster, 5½" hole
Lathe, Turret, No. 4 Warner & Swasey
Miller, 30" Newton continuous rotary
Miller, Nos. 10 & 45 Predustomatic
Miller, No. 3 Turnmillers
Miller, 48" Oesterlein tilted offset
Miller, No. 1 Davis Thompson Duplex
Miller, No. 3 Cincinnati high power
Miller, No. 3 Reed Prentice vertical
Miller, No. 2 Van Norman duplex
Miller, No. 3 Brown & Sharpe vertical
Miller, No. 4 Cincinnati
Planer, 24" x 24" x 8' Gray
Planer, 36" x 36" x 16' Cleveland openside
Press, No. 53 Toledo straight side
Press, No. 79½-D Toledo Dbl. Cr. toggle
Press, 28", No. 71 Swaine double crank
Press, No. 174 Consolidated gap double crank, roll feed
Press, No. 33 Consolidated arch frame
Press, No. 2 Standard screw type
Press, 8 ton No. 83 General Flexible
Press, 51", No. SG54 Ferracute double crank
Press, No. 1 Toledo OBI
Riveter, Nos. 3A, 5½-B & 7B High Speed
Roll, No. 1 Ajax forging
Roll, No. H60 Yoder crown feeder
Saw, Cold, 4" 7" & 8" Higley
Saw, Cold, 36" Newton
Shaper, 16" Milwaukee
Shaper, 36" Morton draw cut
Shear, 8" x 8" x 1" L. & A. double angle
Shear, 1½" Lewis alligator
Slotter, 4" Garvin
Sprue cutter, Tessmer, Model 1
Swager, No. 6 HS Langelier
Upsetter, 4" Ajax, suspended slides
Welder, 375 KVA Fisher Body press
Welder, butt, 80 KVA Taylor Winfield B8

SEND FOR COMPLETE STOCK LIST

MILES MACHINERY CO., SAGINAW, MICH.

GRINDERS
Fitchburg Spline Shaft Grinder.
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
2—4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
2 6 Fellows Gear Shaper, Cone.
2 3 Adams Farwell Gear Hobber.
2 2 Pfauter Gear Hobber.
2 18H Gould & Eberhardt Gear Hobber.

PLANERS
42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drive.
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.
36" x 36" x 18' American Planer, 2 Hds.

RADIAL DRILLS
2½' American Plain, M.D.
3' American Sensitive.
3' American Plain.
3' Cincinnati Bickford Plain Radial Drill.
5' Cincinnati Bickford M.D.
4 spindle Sipp, Power Feeds.

MISCELLANEOUS
14" Niles Slotter.
1500 Bell Steam Hammer.
2 4 Cincinnati Vert. High Power Mill, M.D.
2 2B Brown & Sharpe Plain Miller, S.P.D.
2 2 Cincinnati H.P. Universal Miller, S.P.D.

CINCINNATI MACHINERY & SUPPLY CO
217 East Second St., Cincinnati, Ohio

4' Universal Radial Drill, B.D.
26" x 14' Bridgeford Geared Head Lathe
2 14 Cochrane-Bly Vert. Miller & Shaper, M.D.
12" x 32" Landis Universal Grinder
24" Gisholt Turret Lathe, 6¼.
26"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Morton Draw Cut Shaper.
No. 3 Catlin Keyseater 23" x 2", M.D.

West Penn Machinery Company
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MILWAUKEE 2 2-B Heavy Duty Plain Milling Machine, Double Overarm, AC-MD.

MICRO Internal Grinding Machine, Quick Change Geared, with regular table and swiveling table fixture.

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Carlton 4' Radial Drill, motor on arm
24" x 15' Lodge & Shipley Lathe, M.D.
No. 6 Fellows Gear Shaper

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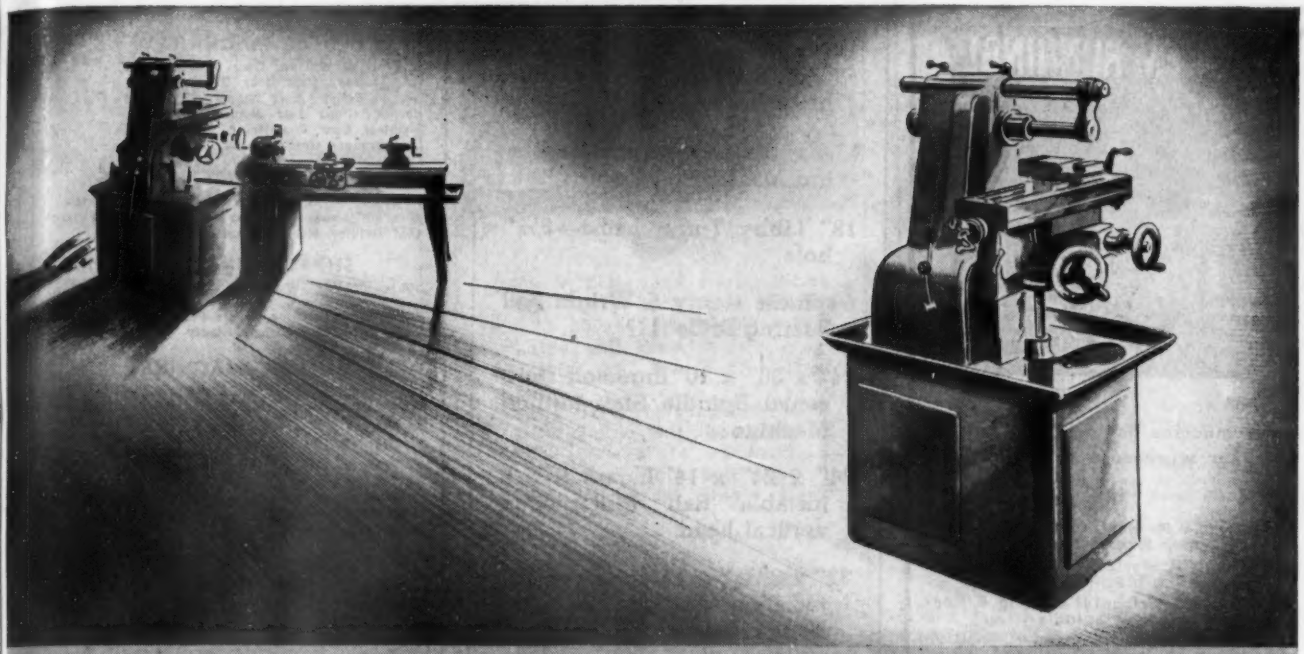

O'BRIEN BRINGS MACHINES BACK TO LIFE

INDUSTRY has one outstanding rule as a reason for success. It is this: Don't waste time, motions, or materials. • Fundamentally, this is the thought behind the O'Brien Method of rebuilding machinery and power plant equipment. O'Brien works to save the materials, labor motions and many hours of original life that remain available in almost any used machine. • O'Brien builds the life back into machines, and the resulting savings are passed along to you, *your* purchasing is simplified, *your* deliveries are improved. •Remember now and after the war O'Brien rebuilt always means time, motions, and materials saved. Remember, too, O'Brien rebuilt means O.K. in every way and *guaranteed.*

IN STOCK—HIGH GRADE MACHINE TOOLS

BORING MILLS—
10'—16' NILES, extension type, 2 heads geared feeds.
42" PUTNAM, vertical, 2 heads, Q.C. feeds, power rapid traverse, 44" swing, threading attach., M.D.
4½" NILES-BEMENT-POND, horizontal, table type, 33"x60" table, duplex controls, M.D.

RADIAL DRILLS—7' DRESES, "HIGH DUTY," 17" diameter column, universal, tap. attach,. gear box M.D.
5' NILES, 13" dia. col., semi-univ., univ. table, belt or M.D.
4' CINCINNATI-BICKFORD, 11" dia. col., tap. attach., gear box M.D.

GEAR CUTTER—#4 BROWN & SHARP, 36"x10" cap., S.P., like new.

GRINDERS—#2 BROWN & SHARP, universal, 12"x30" cap., pump, Excello intern. attach.
#309 BESLY, 30" horizontal disc, 15 H.P. motor drive.
#2 LA SALLE, surface, 6"x18" cap., mag. chuck.
#1 WILMARTH & MORMON, surface, cap. 6"x14", mag. chuck, B.B.

MILLING MACHINES—#2 ROCKFORD, plain, heavy, table 50"x10" w. s., Q.C., M.D.
#2 OHIO, universal, all geared head, S.P.D.
#1 BROWN & SHARP, vertical, Q.C. feeds.
#1½ BROWN & SHARP, universal, Q.C. feeds, divid. heads, motorized.
2—FOX, plain, table 27" x 6¾", power feed, M.D.

PLANERS—48"x48"x20' CINCINNATI, 3 heads, M.D.
36"x36"x10' GRAY "EXTRA HEAVY", 3 heads, excellent.
30"x30"x8' GRAY, 2 heads, motor drive, "SPIRAL-GEARED"

GEARED HEAD LATHES—20" x 22' REED-PRENTICE, All geared head, Q.C., 22½" swing, 17' centers, taper attach., chuck, M.D., cab, legs.
20"x10' LODGE & SHIPLEY, 12 speed "Selective" geared head, chuck, M.D.
18"x10' LODGE & SHIPLEY, 12 speed "Selective" geared head, taper attach., M.D.

LATHES—36"x12' DRAPER, heavy, internal grd., p.c., chuck.
32"x12' PITTSBURG, heavy, DBG, Q.C., motorized.
24"10' LODGE & SHIPLEY, Q.C., cone, chuck, belt drive.
18"x10' HAMILTON, blocks to 26", p.c., chuck, motorized.
16"x8' LeBLOND, Q.C., 4 step cone, drop lever positive feeds. motorized.
14"x6' LODGE & SHIPLEY, 4 step cone, quick change, chuck.

MISCELLANEOUS
16" SMITH & MILLS shaper, vise, 4 step cone.
#8 S.A. WOODS timber sizer, cap. 30"x16", 75 H.P. motor.
10' LOY & NAWRATH power shear, 10 gauge cap.
#ME-PELS, combin. punch, shear, angle cutter, all-steel, M.D.
#263 BARNES drill, #5 taper, all geared, M.D.

Everything from a Pulley to a Power House

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SEARCHLIGHT SECTION

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Every machine listed in this column is in our warehouse at press time.

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4½" Bar, N.B.P. Horizontal Boring Mill, Knee Type, 30"x90" table, M.D.
ǂO FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
ROCKFORD Horizontal Drilling & Boring Machine 3⅜" spindle
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
33" x 9" GOULD & EBERHARDT Spur Gear Cutter
3' WESTERN Plain Radial Drill
7' AMERICAN Universal Radial Drill, M.D.
15" GLEASON Bevel Gear Generator
14"x5' PRENTICE G. H. Lathe
42" PUTNAM Double End Car Wheel Lathe, M.D.
ǂ3-B MILWAUKEE Plain Miller
ǂ2 CLEVELAND Plain Miller
ǂ10 NILES Vertical Milling Machines
ǂ6 BECKER Vertical Milling Machine
30"x30"x10' NEWTON Slab Miller
12" Wm. SELLERS Slotters
20" SELLERS Crank Slotter, M.D.
12"x12" ACME Power Hack Saw, M.D.
48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
24"x24"x6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
42"x48"x12' SIMMONS Openside Planer, 230 volt D.C.
ǂ3 WARNER-SWASEY Turret Lathes, 3⅛" bar capacity
ǂ1 L&A Multiple Punch, 100 Tons, 72" between housings
6"x6⅝" SOUTHWARK Double Angle Shear
SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8" x 1 1/16 LONG & ALSTATTER Shear
54" Throat 1¾"x1⅛" HILLES & JONES Punch
42" Throat, 1¾"x1" HILLES & JONES Punch, M.D.
4" LANDIS Pipe Threading Machine
6" BIGNALL - KEELER Duplex Pipe Machine
10" STANDARD Pipe Threading Machine
4" BAKER Heavy Duty Automatic Tapping Machine
ǂO BAKER Keyseater, M.D.

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany 1, N. Y.
N. Y. Office: 149 Broadway

72" x 48" x 24' Gray Planer—two hds. on rail reversing motor drive

3" bar Universal Horizontal Boring Machine

18" Libby Turret Lathe—3½" hole

4-spindle Henry & Wright Ball Bearing Drills (11)

24" x 36" x 10' Ingersoll Horizontal Spindle Slab Milling Machine

24" x 24" x 14' Ingersoll Adjustable Rail Miller one vertical head

32" x 37½" x 12' Ingersoll Adjustable Rail Miller two vertical heads

HILL CLARKE MACHINERY COMPANY

651 Washington Boulevard
Chicago 6, Illinois

OTT MACHINERY SPECIALS

AUTOMATICS, Acme, Model C—9/16" M.D.
AUTOMATICS, Gridley, 9/16" & ⅝" Model G
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" S.S.
AUTOMATICS, Cleveland, 1¼, 1½, 2¾ & 3¾"
AUTOMATICS, Cleveland, ⅝, 1¼ & 2½" Mod. B
AUTOMATICS, Cleveland, 1¼ & 1½" Model M
AUTOMATICS, Cleveland, 3½" Model K4
AUTOMATICS, Cone 1¼ & 1½" 4 spdles, M.D.
AUTOMATICS, New Britain ǂ22 M.D.
AUTOMATICS, Cotter & Johnson ǂ5A & 6A
DRILLS, Baker Heavy Duty, ǂ5 M.T.
GEAR HOBBERS, ǂ5A Loss Bradner, M.D.
GEAR HOBBERS, ǂ3 and 12 Barber-Colman
GEAR SHAPERS, ǂ7 High Speed, M.D. & ǂ61.
GRINDER, Blanchard ǂ16 A.R. 5, 30" x 18" Magnetic Chuck, M.D.
GRINDER, Brown & Sharpe ǂ10 & 12 M.D.
GRINDERS, Landis, 6" x 18" Plain M.D.
MILLING MACHINES, Becker Vertical, Model S. D. 40" Rotary Table
MILLING MACHINES, Becker Vertical ǂ3 & 5.

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit 26, Mich.

MISCELLANEOUS MACHINES

1—10-ton Harnischfeger Traveling Crane, 52' span, fishbelly type, with two 5-ton trolleys, cab and 35 KW motor generator set.

48"x36"x16' Gray Dbl. Housing Planer, 3 hds., 15 HP, A.C. m.d.

12"x18" Cinci. Plunge Cut Grinder, A.C. m.d.

20"x8" face wheel, rebuilt.

STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio **2832 East Grand Blvd., Detroit, Michigan**

GEAR MACHINERY

9' Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
No. 6 Fellows Gear Shaper
Cimatool Gear Chamfering M.D.
Lees-Bradner Gear Grinder

LATHE — TURRET LATHES

6" x 6¾" Gess & DeLeeuw Chucking Machine
3" x 36" Jones & Lamson Turret Lathe, bar feed
1⅜" Gridley Model G Auto., M.D.

SHAPERS — PLANERS

36" x 36" x 8' Woodward & Powell Planer, Rev. M.D.
36" x 48" x 12' Cinc. Hypro Planer, 4 Hds.
18" x 18" x 4' Whitcomb Planer

MILLING MACHINES

4¼ x 12" Pratt & Whitney Thread Millers (2)
No. 25B Defiance Hor. Bor. Mill—1941 model.
6" x 48" Pratt & Whitney Thread Miller

GRINDERS

10" x 120 Norton Grinder, M.D.
ǂ10 Brown & Sharpe Pl. Grinder, M.D.
No. 91-A Cavel Cutter & Tool Grinder
No. 2 Oesterlein Cutter & Tool Grinder

MISCELLANEOUS

21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Sprue Cutter
12" Lamb & Nash Type K Slitter
New Delta Drilling Equipment

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge, Mass.

UNUSUAL VALUES

Belt Cutter 1" capacity, 3 spindle
Brake Robinson 5' toggle
Compressor, 120 Schramm, portable
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, ǂ1 Morse taper
Grinder, ǂ20 Bryant deep hole internal
Grinder, Sellers Tool
Hammer, 50ǂ Bradley upright helve
Kelley, 16" back geared shaper
Lathe, 24" x 18" Steptoe-McFarlan
Pipe Machine, 6" Merrell
Pipe Machine, 8" Oster, motor drive
Press, ǂ8-7 Zah-Hahnemann straight side grd.
Press, ǂ1 open back inclinable, motor drive.
Punch & Shear, two ½" capacity
Threading Machine, ǂ0 Webster & Perks
Turret Lathe, L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

HYDRAULICS

1—W-F 1000 ton press, 20" ram, 7" stroke
1—Elmes 1½ x 4" Horiz. 4 plunger pump, 6½ GPM, 5000ǂ W.P.
1—Triplex Pump 1 x 5, 1000 cu. in., 6000ǂ W.P.
2—Horiz. 4 pl., 60 GPM, 2000ǂ
2—Triplex 200 GPM, 500ǂ
2—Triplex 24 GPM, 2500ǂ
1—Accumulator 10" x 12', 2500ǂ
1—Accumulator 15" x 11', 450ǂ
1—150 Ton C Frame Steam Hydraulic Forging Press

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

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361 Atlantic Ave., Boston, Mass.

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INGERSOLL 24"x30"x8' Table, Planer Type Production Miller with Vertical Head and 2 Side Heads, Adjustable Rail. Direct Motor Driven with new 25 H.P. Motor & Controls. Can be seen in operation.

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For Immediate Shipment
No Priority Required

MULTIPLE SPINDLE DRILLS

No. C2OH Natco, m.d., hydraulic feed, 16 spindles 2⅝" dia. No. 4 Taper, circular table, 30" drilling area, 50 H.P. main drive motor and 3 small motors
No. 2 Baush, m.d., tapping attach., 16 spindles No. 3 taper
No. 2 Baush, m.d., arr. 20 spindles, equipped with 8—16x30" rect. head
No. 2 Baush, m.d., hydraulic feed, 38x21" head, cap. 45 spindles, equipped with 12
No. 2 Baush, m.d., hydraulic feed, 16x30" head, cap. 24 spindles, equipped with 12, No. 2 taper
No. 3 Baush, s.p.d., 20x40" head, 15 spindles, No. 3 taper
No. 11 Pratt & Whitney, belt, 14x9" rect. head, 10 spindles, No. 1 taper
No. 22AC Fox, m.d., 16" round head, 6 spindles, No. 1 taper
No. 26C Fox Tapper, s.p.d., 35x17" head, 50 spindles, No. 1 taper
3 spindle 12" Rockford Gang Drill, m.d.
4 spindle Harrington H.D. Rail Drill, No. 4 taper, 13'0" rail

HORIZONTAL DRILLS

No. 008 Garvin Duplex, belt
Leve Bros. Horizontal, No. 4 Taper, 15" horizontal travel
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic
8 spindle Hammond, m.d., hydraulic feed

RADIAL DRILLS

2' American Triple Geared, gear box
2½' Carlton Sensitive, gear box
3' American Hole Wizard, m.d. thru gear box on arm
3' American Triple Purpose, m.d. thru gear box on arm, 11" column
3' American Sensitive, cone
3' Carlton Sensitive, cone
3' Cincinnati Bickford Plain, gear box on base
3' Fosdick Sensitive, s.p.d.
3' Western Plain, gear box
3½' Cincinnati Bickford Plain, U.S. VariDrive
3½' Cincinnati Bickford Plain, d.c. motor
4' Cincinnati Bickford Super-Service, m.d. on arm, 13" column
4' Cincinnati Bickford Plain, U.S. VariDrive
4' Cincinnati Bickford Plain, d.c. motor drive
4' Hammond Jack-Knife, belt
4' Niles-Bement-Pond Semi-Universal, U.S. VariDrive
5' American Triple Geared, gear box on base, 13" column
5' Cincinnati Bickford Super-Service, 17" column, m.d. on arm
5' Niles-Bement-Pond Full Universal, gear box on base
5' Prentice Plain, U.S. VariDrive
6' Niles-Bement-Pond Semi-Universal, U.S. VariDrive, 15" column
6' Niles-Bement Pond Semi-Universal, d.c. motor drive
7' American Triple Purpose, d.c. motor drive on arm, 16" column

UPRIGHT DRILLS

20" Cincinnati, m.d.
22" Aurora, belt
22" Barnes All Geared Self-Oiling
24" Cincinnati Bickford, d.c. motor drive
24" Cincinnati Bickford, a.c. motor drive
24" Hoefer, belt
24 Sibley, m.d.
25" Superior, belt
36" Prentice, belt

GEAR CUTTERS & HOBBERS

No. 3-26" Cincinnati Spur Gear Cutter
No. 3-26" Brown & Sharpe
No. 3-36" Brown & Sharpe
No. 3 Heavy Brown & Sharpe
No. 4-36" Brown & Sharpe
No. 4-48" Brown & Sharpe
No. 6-60" Brown & Sharpe
No. 6-72" Brown & Sharpe
No. 12 Barber-Colman Double Overarm Gear Hobber, m.d.
48" Cleveland Gear Hobber, m.d.
Gleason Spiral Bevel Gear Rougher
No. 72 Fellows H.S. Gear Shaper, m.d.
18" Gleason Straight Tooth Bevel Gear Generator
30" Brainerd Gear Cutter for spur and bevel

CYLINDRICAL GRINDERS

10x36" Landis Integral Cam, m.d.
10x48" Brown & Sharpe Plain Cylindrical, m.d.
10x52" Landis Plain Cylindrical, m.d.
10x72" Landis Plain, m.d.
12x36" Cincinnati Plain, belt

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Dependable Used Machines

DEFIANCE No. 25A Horiz. Boring Mill—3¾" bar—Built in 1941
N.B.P. 38"-44" Vertical Turret Lathe; side head
BULLARD 24" R.P. Vert. Turret Lathe
N.B.P. 96"x90"x15' Planer; 4 heads; DC variable M.D.; box table
N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive
GRAY 24"x24"x6' Single Head Planer
GRAY 72"x48"x12' Planer — two heads; belt drive
HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive
LUCAS #3, 3½" bar Horiz. Boring Mill — Belted M.D.
TAYLOR & FENN 6" Spline Miller; M.D.
CINCINNATI #2 Vert. Miller, M.D.
LEES BRADNER #6 Thread Miller
CINCINNATI BICKFORD 4' & 6' Plain Radial Drills; M.D.
AMERICAN 3' Radial Drill — motor on arm, triple purpose
NATCO C-13 Hyd. Multiple Drill
COLBURN D-3 Drill Press — Capacity 3"
NORTON 12x72" Plain Grinder
NORTON 15"x15"x72" Openside Surface Grinder
LANDIS 20"x220" Plain Grinder
LANDIS #3½ Int. Hydraulic Race Grinder
DIAMOND #4 Surface Grinder; Hyd. Feeds
HEALD #60 Internal Grinder; M.D.
GLEASON 6"-18" Bevel Gear Generators
BROWN & SHARPE #3H Gear Cutter
ESPEN LUCAS No. 138 Cold Saw — Cap. 12"
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancer
LONG & ALLSTATTER Double Angle Shears
100 Ton Horiz. Hydraulic Forcing Press
CINCINNATI Gear Burnisher; M.D.
HENDEY 16" & 20" Back Geared Shapers
GOULD & EBERHARDT 24" Shaper —motor drive
LYND FARQUHAR 26" Planer Type Shaper

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⅞" Cleveland Model M, four spindle
⅞" Gridley Model G, single spindle
¾" Gridley Model F, four spindle
No. 00 Brown & Sharpe, single spindle

BROACHES

No. XB 10 Oilgear Hydraulic, horizontal
15 Ton Hercules Mechanical, vertical

DRILLS

4 ft. American Radial, s.p.d.
4 ft. Dreses Radial, s.p.d.
No. 14 Colburn, single spindle
No. 310 Baker, single spindle
24" Barnes Camelback, single spindle
Henry & Wright Sensitive, two spindle
Leland-Gifford, Sensitive, three spindle
No. 11 Natco Multiple Spindle
No. 13 Natco Multiple Spindle

GEAR CUTTERS

No. 6 Fellows Gear Shaper, m.d.
30" x 10" Maag Gear Shaper, m.d.
11" Gleason Straight Bevel Gear Generator
No. 10 Lees Bradner Gear Grinder, m.d.
No. 3 Brown & Sharpe Automatic Gear Cutter
30" Consolidated Gear Tooth Rounder
96" Gleason Spur & Bevel Gear Planer.

GRINDERS

10" x 36" Norton Cylindrical
No. 3 Landis Universal
22" x 48" Pratt & Whitney Surface
30" Diamond Face, 84" table travel
No. 3 Wilmarth & Morman Surface
No. 12 Brown & Sharpe Cutter
No. 1½ Cincinnati Cutter
No. 2 Sellers Carbide Tool

LATHES

14" x 6' American, c.d.
14" x 10' Pratt & Whitney, c.d.
18" x 15' Schumaker, Boye & Emmes, c.d.
20" x 8' Greaves & Klusman, c.d.
20" x 12' American, g.h.
22" x 10' Lodge & Davis, c.d.
29" x 14' Schumaker, Boye & Emmes, c.d.
8" x 60" Fitchburg Lo-Swing, g.h.

TURRET LATHES

24" Bullard New Era V.T.L., m.d.
36" Bullard New Era V.T.L., m.d.
12" Bullard Mult-au-Matic, m.d.
No. 1A Warner & Swasey, m.d.
No. 1B Foster, m.d.
2¼" x 24" Jones & Lamson, m.d. (serial over 40,000)
18" Libby Universal, m.d.
No. 2, 4, 6, Warner & Swasey, c.d.

MILLS

No. 2 Rockford Plain, m.d.
No. 2 Oesterlein Plain, c.d.
No. 1 Garvin Universal, c.d.
No. 2 Kempsmith Vertical Maximiller, m.d.
No. 3 Brown & Sharpe Vertical, m.d.
Model C Becker Vertical, m.d.
Model B Gooley & Edlund, c.d.
No. 12 Brown & Sharpe, c.d.
144" Betts Vertical Boring Mill, 2 head, m.d.
4" Fosdick Horizontal Boring Mill, m.d.
Pratt & Whitney Spline Mill

MISCELLANEOUS

16" Betts Slotter
100 lb. Bradley Helve Hammer
Pratt & Whitney Design Profiler
P2 Ferracute Press, m.d.
13" x 13" Peerless Universal Saw

PLANERS & SHAPERS

24" x 24" x 8' American Planer, one head
30" x 30" x 12' Ohio Planer, one head
38" x 38" x 12' Niles Planer, 2 heads
72" x 56" x 20' Cincinnati Hypro, 4 hds
96" x 96" x 25' Detrick & Harvey, 4 heads
20" Ohio Crank Shaper, s.p.d.

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42" Niles Bement Pond Boring Mill, 2 heads on rail, all geared feeds, motor driven, with motor.

42" x 42" x 20' American Planer, 2 heads on rail.

2A Warner & Swasey Turret Lathe.

3A Warner & Swasey Turret Lathe, motor drive with motor.

5' Prentice Radial Drill, motor driven, with motor.

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KEARNEY & TRECKER 3K Plain Vertical Milling Machine; All power feeds, rapid traverse, motor in base, dial type indicator, micrometer dial stops. New in 1941.

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POND 84" x 72" x 20' Planer; 2 heads on rail, 2 side heads, arranged for motor drive with D.C. reversing motor and controls.

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#3B **Kearney & Trecker** Vertical, m.d.
#2 **B & S** Vertical, m.d.
Newton 2 sp. Rotary Miller.
#3A **Warner & Swasey** Turret Lathe
2B **Foster** Turret Lathe
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5' **Western** Radial Drill
#40 **United** sliding frame Hot Saw, motor driven, with motors. Capacity, 36" blades.
3" **Bliss** Horizontal Boring Mill
5" **Beaman & Smith** floor type Boring Mill, m.d.
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8" x 18" **Cincinnati** Grinder, m.d.

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Departmental Staff
AMERICAN MACHINIST

S.A.E. 2330 BARS

Item No.	
100..13/16" Hex. H.R.A.	1600 lbs.
101..⅞"..Dia. C.D. H.T.	10000 lbs.
102..⅞" Hex. C.D.A.	lbs.
103..15/16" Dia. C.D.A.	136 lbs.
104..15/16" Dia. C.D. H.T.	18220 lbs.
105..1 5/16"..Dia. C.D.N.	1343 lbs.
106..1⅜" Dia. C.D. H.T.	5500 lbs.
107..1 7/16" Dia. H.R.A.	10449 lbs.
108..1 7/16" Dia. C.D. H.T.	11880 lbs.
109..1½" Hex. H.R.A.	lbs.
110..1 9/16" Dia. H.R.A.	350 lbs.
111..4¼" R.C.S. H.R.A.R.	9000 lbs.

S.A.E. X4130 BARS

112..5/16" Dia. H.R.A.	5365 lbs.
113..⅝" Dia. C.D.H.T.	10323 lbs.
114..15/16" Dia. C.D.H.T.	196 lbs.
115..15/16" Dia. C.D.N.	34438 lbs.
116..1" Dia. C.D.H.T.	21164 lbs.
117..1 1/16" Dia. H.R.A.	1757 lbs.
118..1⅜" Dia. C.D.H.T.	lbs.
119..1 7/16" Dia. C.D.N.	13105 lbs.
120..1⅞" Dia. C.D.A.	1174 lbs.
121..1⅞" Dia. C.D.N.	28800 lbs.
122..1⅞" Dia. C.G.	11048 lbs.
123..3¼" Dia. H.R.A.	749 lbs.
124..3⅞" Dia. H.R.A.	20798 lbs.
125..4" Dia. H.R.A.	lbs.
126..1⅜" sq. H.R.A.	1000 lbs.
127..2¼" R.C.S. H.R.A.	21900 lbs.
128..3⅜" sq. R.C.S. H.R.A.	1470 lbs.
129..4" sq. H.R.A.	182091 lbs.
130..⅛" x ⅝" C.D.H.T.	110 lbs.
131..⅜" x ⅝" H.R.H.T.	lbs.
132..⅝" x 1" C.D.A.	262 lbs.
133..5/16" x 4" H.R.A.	29503 lbs.
134..⅝" x 1" H.R.A.	977 lbs.
135..9/16" x ⅝" H.R.A.	1084 lbs.
136..⅝" x 1¼" H.R.A.	6500 lbs.
137..⅞" x 1⅛" H.R.A.	16032 lbs.
138..⅞" x 1 5/16" H.R.A.	2070 lbs.
139..⅞" x 1 7/16" H.R.A.	10506 lbs.
140..1" x 1¼" C.D.H.T.	322 lbs.
141..1 1/16" x 1⅛" H.R.A.	965 lbs.
142..1¼" x 1⅞" H.R.A.	6239 lbs.
143..1⅛" x 1 11/16" H.R.A.	6280 lbs.

NE-8739 BARS

144..1¾" Dia.	29362 lbs.

NE-8740 BARS

145..2¼" Dia.	19880 lbs.
146..2⅜" Dia.	25137 lbs.

S.A.E. X4140 BARS

Item No.	
147..1 3/16" Dia. C.D.H.T.	2097 lbs.
148..1 3/16" Dia. H.R.A.	5290 lbs.
149..1 11/16" Dia. H.R.A.	115000 lbs.
150..1 11/16" Dia. C.D.A.	121565 lbs.
151..2⅛" Dia. H.R.A.	47733 lbs.
152..4" Dia. H.R.A.	
153..3" sq. H.R.A.	427 lbs.
154..6" sq. H.R.A.	5652 lbs.
155..⅝" x 1½" C.D.A.	7800 lbs.
156..⅞" x 1½" H.R.A.	8625 lbs.
157..⅞" x 2⅜" H.R.A.	17969 lbs.

CHROME NICKEL BELGIAN STEEL (4% NICKEL)

210...3209 C.N. Bar	855 lbs.
211...3209 C.N. Bar	465 lbs.
212...4035 C.N. Bar	8650 lbs.
213..1.378 C.N. Bar	2334 lbs.
214..1.496 C.N. Bar	2247 lbs.
215..1.575 C.N. Bar	476 lbs.
216..2" Dia. C.N. Bar	1127 lbs.
217..2 3/16" Dia. C.N. Air Hard Bar	1637 lbs.
218..2¼" Dia. C.N. Bar	553 lbs.
219..2⅜" Dia. C.N. Bar	246 lbs.
220..4.72" Dia. C.N. Bar	2814 lbs.
221..4.92" Dia. C.N. Bar	1689 lbs.
222..5⅝" Dia. C.N. Bar	2244 lbs.
223..6" Dia. C.N. Bar	2114 lbs.
224..6¼" Dia. C.N. Bar	1607 lbs.
225..8" Dia. C.N. Bar	2300 lbs.

STEEL INGOTS

226..10¼" square Steel Ingots (Chrome Vanadium)	

STEEL BILLETS & BARS

227..5/16" Dia. SAE 1040	500 lbs.
228...7/16" Dia. SAE 3245	1009 lbs.
229..9/16" Dia. SAE 3140	239 lbs.
230..⅝" Hex. SAE 2330	958 lbs.
231..1" Dia. Nickel Steel Spec. 468-23	341 lbs.
232..1 1/16" Dia. SAE 1314	1813 lbs.
233..1¼" Dia. C 1118	9069 lbs.
234..1⅜" Dia. SAE 1314	580 lbs.
235..1 7/16" Dia. SAE 3115	1016 lbs.
236..1½" Dia. SAE 3312	
237..1⅝" Dia. SAE 3312	421 lbs.
238..⅜" Dia. CNMV	16676 lbs.
239..4" square X4135 Billets	

STEEL BILLETS & BARS (Con't.)

Item No.	
240..5⅝" Dia. SAE 3145 Bar	
241..Steel Ingots SAE 6135	489 lbs.
244..7/16" Hex. C.M.S. Billet	5379 lbs.
245..⅜" Dia. N.S. Bar	2845 lbs.
246..⅝" Hex. N.S. Bar	1013 lbs.
247..⅝" Hex. C.M.S. Billets	9367 lbs.
248..1" Hex. C.M.S. Billets	1567 lbs.
249..1 1/16" Hex. N.S. Bar	441 lbs.
250 1 1/16" Hex. C.M.S. Billets	7996 lbs.
251..1⅜" Dia. N.S. Bar	5314 lbs.
252..1 7/16" Hex. N.S. Bar	3914 lbs.
253..1½" Hex. C.M.S. Billets	3271 lbs.

S.A.E. X4140 CHROME MOLY STEEL BARS

254..1 25/32" x 6 9/16" H.R.A.	25000 lbs.
255..1" x 1¼" H.R.A.	31111 lbs.
256..1" x 1⅝" H.R.A.	3432 lbs.
257..1⅛" x 1 5/16" H.R.A.	
258..1⅛" x 3½" H.R.A.	10637 lbs.
259..1¼" x 3½" H.R.A.	1376 lbs.
260..2" x 2⅜" H.R.A.	973 lbs.
261..2½" x 4" H.R.A.	119 lbs.
262 2¾" x 7⅛" H.R.A.	146 lbs.
263..2¾" x 17" H.R.A.	450 lbs.
264..3" x 3½" H.R.A.	560 lbs.
265..5" x 6" H.R.A.	194 lbs.

S.A.E. X4340

266..1¼" Dia. H.R.A.	415 lbs.
267..2¼" Dia. H.R.A.	12031 lbs.
268..2⅜" Dia. C.D.N.	5090 lbs.
269..1¼" Hex. C.D.N.	
270..11/16" x 4" H.R.A.	11064 lbs.
271..4" square H.R.A.	
272..6" square H.R.A.	
273..1" Hex. C.D.N.	3139 lbs.

STAINLESS STEEL BARS

282..⅝" square (18-8) C.D. mill lengths 16/20'	74884 lbs.

ELECTRIC FURNACE AIRCRAFT QUALITY

X-4130

296..⅛" dia. C.D. Norm.	200 lbs.
297..3/16" dia. H.R. Ann.	1000 lbs.
298..9/16" dia. C.D. 125,000 psi	5000 lbs.

ELECTRIC FURNACE AIRCRAFT QUALITY (Continued)

X-4130

Item No.	
299..⅝" dia. C.D. Norm.	18000 lbs.
300..⅝" dia. C.D. Ann	651 lbs.
301..⅝" dia. H.R. Ann.	164 lbs.
302..13/16" dia. C.D. 125,000 psi	12000 lbs.
303..⅞" dia. C.D. H.T.	
304..1" dia. C.D. Norm.	10000 lbs.
305..1 1/16" dia. C.D. Norm.	
306..1⅛" dia. C.D. Norm.	6647 lbs.
307..1 5/16" dia. C.D. Norm.	10000 lbs.
308..1 5/16" dia. H.R. Ann.	6480 lbs.
309..1⅜" dia. H.R. Ann.	1854 lbs.
310..2" dia. H.R. Ann.	
311..2½" dia. C.G. Norm.	
312..⅜" square C.D. Ann.	3960 lbs.
313..1¼" square H.R. Ann.	5810 lbs.
314..1/16" hex. C.D. Ann.	1400 lbs.
315..11/16" hex. C.D. Norm.	290 lbs.
316..⅝" x ⅞" H.R. Ann.	1627 lbs.
317..1¼" x 1 5/16" H.R. Ann.	805 lbs.
318..1¼" x 3⅜" H.R. Ann.	69376 lbs.
319..1⅝" x 1⅞" H.R. Ann.	3744 lbs.

4140

320..3/16" dia. H.R. Ann.	3000 lbs.
321 ⅜" dia. C.D. Norm.	4000 lbs.
322..⅝" dia. C.D. Norm.	15000 lbs.
323..⅞" dia. C.D. 125,000 psi	8396 lbs.
324..13/16" dia. C.D. 125,000 psi	5000 lbs.
325..⅞" dia. C.D. Norm.	5000 lbs.
326..15/16" dia. C.D. Norm.	10000 lbs.
327..1" dia. C.D. Norm.	25000 lbs.
328..1 3/16" dia. C.D. Norm.	15000 lbs.
329 1⅜" dia. C.D. Norm.	8000 lbs.
330..2⅛" dia. C.D. Ann.	7926 lbs.
331..13/16" x 1⅛" H.R. Ann.	11656 lbs.

X-4340

332..1 7/16" Hex. C.D. Norm.	27024 lbs.
333..1 11/16" Hex. C.D. Ann.	14410 lbs.

2330

334..3/16" dia. H.R. Ann.	3835 lbs.
335..¼" dia. C.D. Norm.	2500 lbs.
336..5/16" Hex. C.D. Norm.	2381 lbs.
337..⅜" dia. C.D. Norm.	2000 lbs.
338..⅜" dia. C.D. Ann.	3133 lbs.
339..7/16" dia. C.D. Ann.	5000 lbs.
340..7/16" Hex. C.D. Ann.	15000 lbs.
341..½" Hex. C.D. Norm.	7000 lbs.
342..9/16" Hex. C.D. Ann.	12000 lbs.
343..9/16" Hex. C.D. Norm.	25000 lbs.
344..11/16" dia. C.D. Ann.	2000 lbs.
345..⅝" dia. C.D. Norm.	8000 lbs.
346..1" dia. C.D.	6020 lbs.

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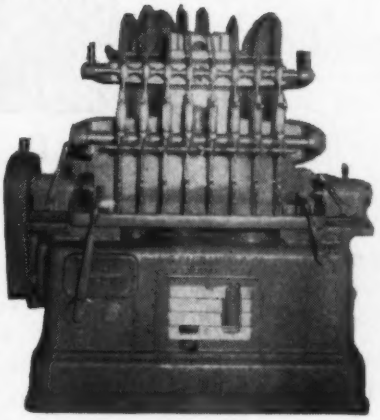

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Arranged for motor drive in the base with motor.

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Butt, 300 KW. Winfield, 60 cy., 440 V.

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60"x60"x12' Niles, 4-hds, belted.
84"x60"x20' Betts, 3-heads, BD (fair)

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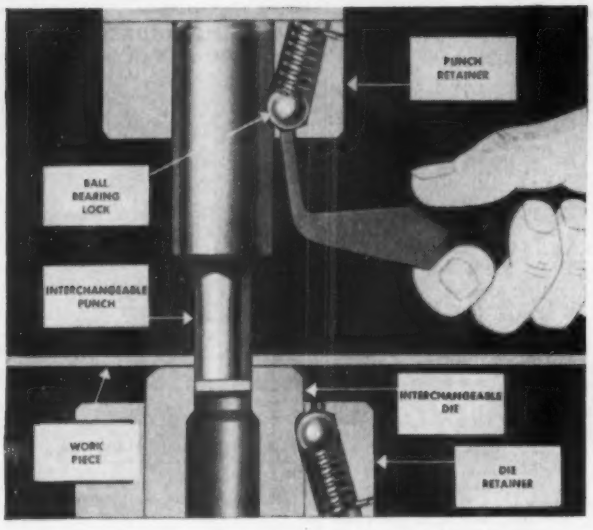

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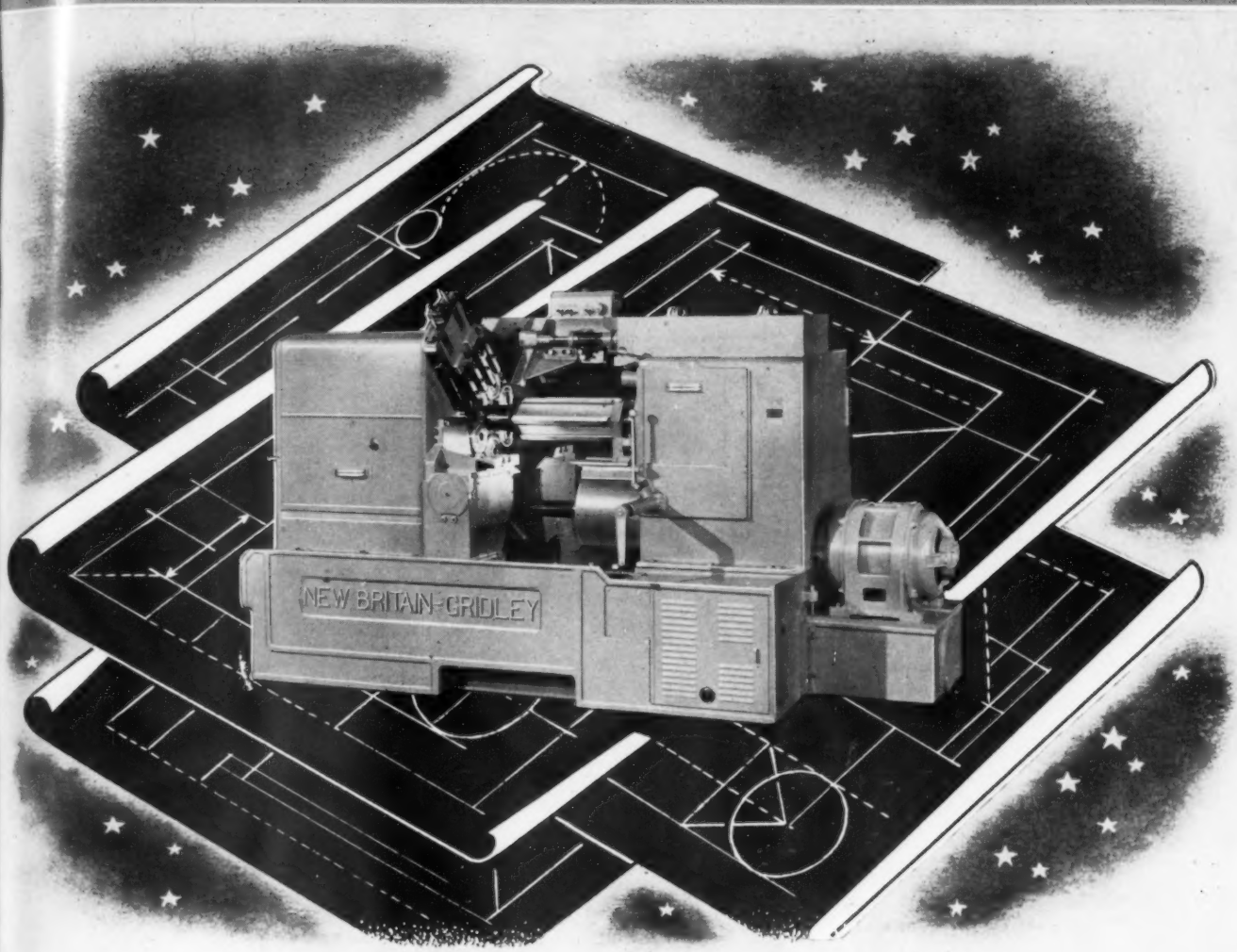

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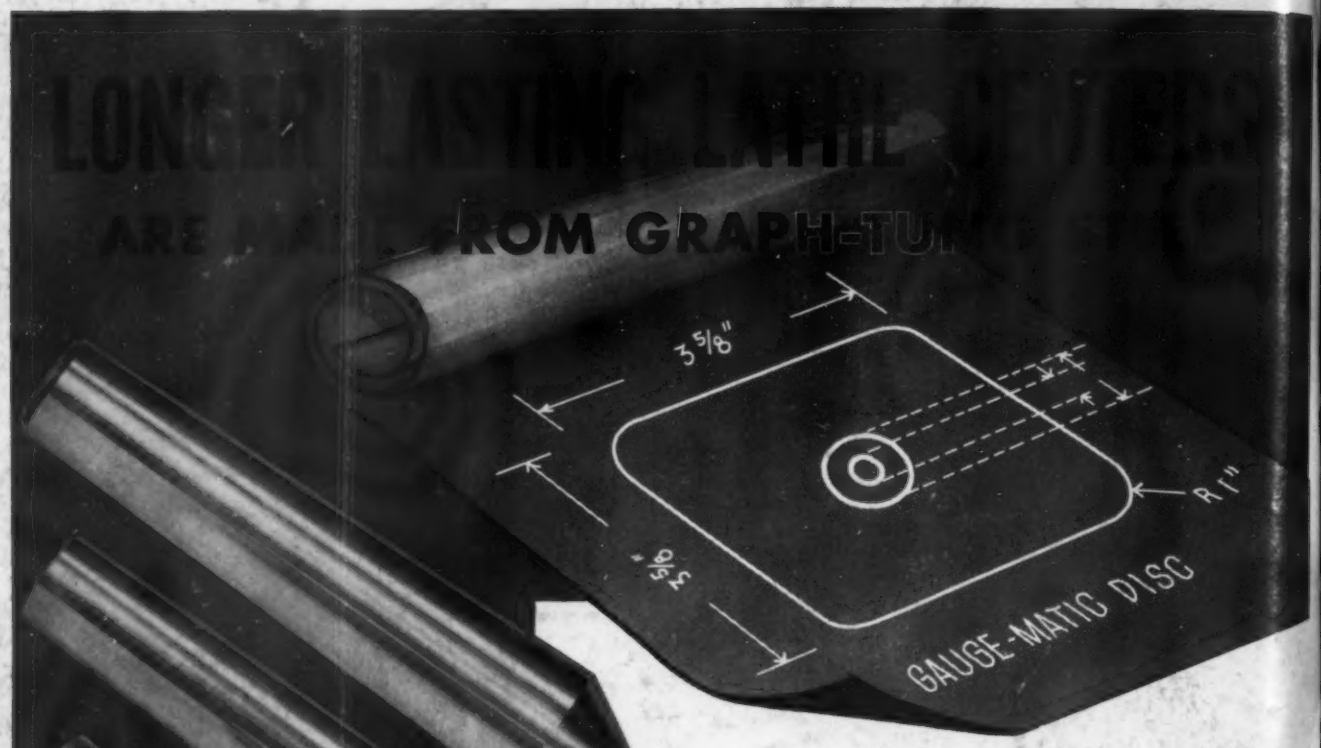

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